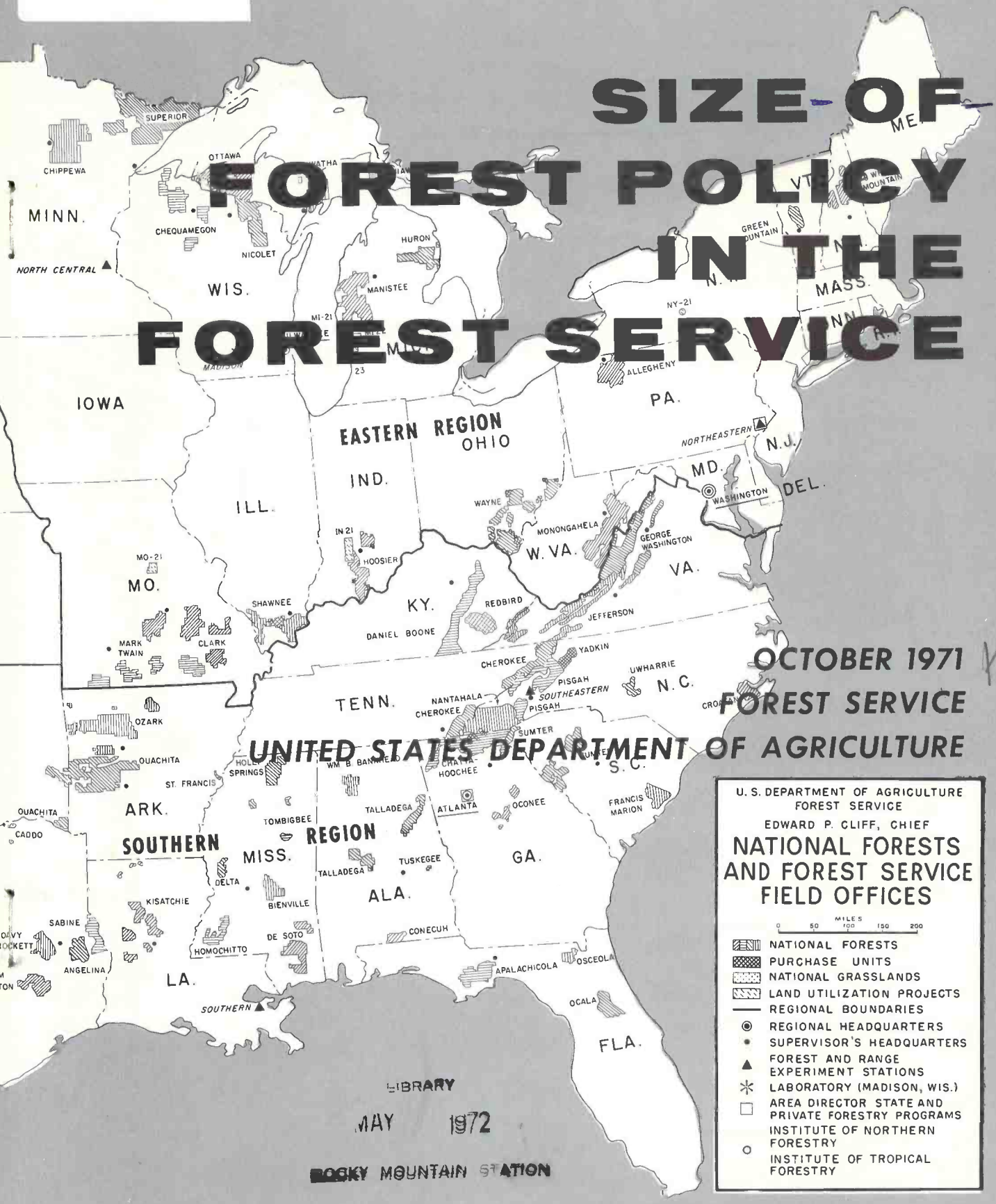
SIZE OF FOREST POLICY IN THE FOREST SERVICE



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FOREST SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE

U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
EDWARD P. CLIFF, CHIEF

NATIONAL FORESTS AND FOREST SERVICE FIELD OFFICES

MILES
0 50 100 150 200

- NATIONAL FORESTS
- PURCHASE UNITS
- NATIONAL GRASSLANDS
- LAND UTILIZATION PROJECTS
- REGIONAL BOUNDARIES
- REGIONAL HEADQUARTERS
- SUPERVISOR'S HEADQUARTERS
- FOREST AND RANGE EXPERIMENT STATIONS
- LABORATORY (MADISON, WIS.)
- AREA DIRECTOR STATE AND PRIVATE FORESTRY PROGRAMS
- INSTITUTE OF NORTHERN FORESTRY
- INSTITUTE OF TROPICAL FORESTRY

SIZE OF FOREST STUDY

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SYNOPSIS

Based on data collected in the size-of-District study and this study there are positive indicators that:

1. Larger Ranger Districts tend to be more effective than smaller Ranger Districts.

2. A minimum of four principal Staff District employees (including the Ranger) is usually a prerequisite for effective District operations.

3. The effectiveness of a Forest is, in general, the cumulative effectiveness of the Ranger Districts that make up a given Forest.

4. The number of Ranger Districts (within a size range of 3 to 14) that make up a Forest has little influence on Forest effectiveness.

5. The number of Ranger Districts that make up a Forest does have a significant influence on the efficiency of a given Forest (costs of operation tend to be highest on small Forests with small Districts).

6. Forests with an adjusted budget (F.Y. 1968 base year) of approximately $3,000,000 or more have a better chance of attaining optimum conditions for effective and efficient Forest operations.

7. In general, administrative action that will tend to create larger Ranger Districts whenever possible with four or more principal staff employees per District, followed by the grouping of such units into the largest adjusted budgeted Forests that on-the-ground conditions permit will tend to create conditions for more effective and efficient Forest units. No specific number of Ranger Districts within a size range of 3 to 14 is recommended.

8. Annual savings from the closing of a Forest Supervisor's office will usually exceed the one-time closing costs in a one- to two-year period.

SIZE-OF-FOREST STUDY

I. INTRODUCTION

For the reader to fully understand the contents of this study, there must be some explanation of the concepts, procedures, and chronological timing that went into the collection, analysis, and summarization of the supporting material.

Briefly, the study was initiated at a meeting in Albuquerque, New Mexico, during June 1968 by a Service-wide team of Administrative Management representatives from the Washington Office, Region 1, Region 3, and representatives from MaSS and UCLA. At this time it was decided that a Washington Office team, a Region 1, and a Region 3 team should proceed rather independently in the collection of data for the study because this could increase the opportunities for developing new concepts and exploring these concepts further as the study developed. The varied concepts between the teams did occur, and were pursued accordingly.

Initially, the Service-wide team also fully recognized that the study--to be meaningful--should attempt to construct concepts that can be used to give some relative measure of the effectiveness and efficiency of a National Forest and also establish some meaningful method of comparing one Forest with another within a Region.

Based on the recent "Size-of-District Study," the Service-wide team was also quick to recognize that--unless an unjustified expenditure of time and funds was expended in pioneering completely new concepts, the "effectiveness" of Forests could probably best be obtained through a subjective analysis of each Forest by the people who know the most about them (i.e., the Regional Forester, Deputy Regional Forester Assistant Regional Foresters, and Branch Chiefs). Consequently, the team agreed a Service-wide questionnaire that could be used to rate the effectiveness of each Forest within each Region would probably be the most productive method. In essence--the questionnaire was completed and the results of the Forest ratings obtained are the primary source of information for the "effectiveness" portion of this study. In the interpretation of the "effectiveness" ratings obtained from the Regional Questionnaires, it must be realized that they are, in a sense, an opinion poll of a group of people occupying key management positions at one given point in time. A similar poll of people in the same positions at another point in time might result in different ratings. One could also conjecture on the results if a structured response would have been requested. This could have required all respondents to evaluate the effect of size on performance. However, we suspect that the over-all conclusions that may have been drawn by studying responses to a structured questionnaire would not be much different from the interpretation we have made in this study.

All respondents knew that size was being studied. We assumed the individual respondent would give his opinion regardless of the coding mechanism used to record it. Several other methods and channels for measuring "effectiveness" were considered and explored, but they proved less productive and inconclusive. These are further discussed in the study.

From an efficiency standpoint, the Service-wide team also recognized a major effort should go into developing "unit" costs that would be comparable between Forests. This was done, but frankly--as we have all experienced in the Cost Reduction and Operations Improvement fields--the development of unit costs that are comparable between Forests is ephemeral. Despite our best efforts, we were unable to come up with true unit costs to express efficiency. We were, however, able to develop some meaningful indicators of efficiency by the analysis of the overhead costs inherent in the management of Forests of variable sizes. These, in turn, were then related to the effectiveness ratings obtained from the Washington Office questionnaire.

The initial material collected on a Service-wide basis by the Washington Office team appeared to substantiate that, generally, large Forests are considered to be more efficient and effective by the people who know them best. The initial material collected by the Regional teams appeared to correlate with the Washington Office findings, and also indicated that there could be a significant relationship between the average size of Ranger Districts and the effectiveness of a given National Forest.

The Service-wide team again met in Albuquerque in June of 1969 to discuss the information collected to date. In general, the consensus was that both approaches may have Service-wide application.

The intent of this report is to pull together the concepts developed by the Washington Office team and the Regional teams and coordinate and correlate these findings into one report that is applicable Service-wide.

II. RECOMMENDATIONS

Recommendations, to be meaningful, must be geared to circumstances or conditions that prevail at the time the recommendations are made.

The management climate that the Forest Service is now operating within is considerably different from approximately five years ago.

With the advent of the "Program for the National Forests" in 1963, appropriation increases were accelerated. The rate of acceleration indicated Forest and then Ranger District staffing could be increased to a point that would soon allow for accomplishment of considerably larger resource development programs with Forests as the "planning" level and Districts as the "doing" level.

The accelerated appropriation period lasted for two years (1963 to 1964), and during this period Forest staffing was increased materially with some increased staffing at the District level. However, the accelerated appropriation period did not continue long enough for the majority of Districts to be staffed to the anticipated level--particularly in those Regions with proportionately heavier measured workloads in Range, Wildlife, and Watershed activities and proportionately lighter measured workloads in Timber, Recreation, and Fire.

The accelerated appropriation period ended in 1965, and little opportunity to make needed increases in District staffing has occurred since. In addition, rather restrictive personnel ceilings and appropriation limitations have been in effect for fiscal years 1966 through 1970. The personnel ceilings are going to be more restrictive in fiscal year 1971.

An obviously large and fully recognized but unfinanced and unmanned portion of the protection and development program needs to be carried out at the Forest and Ranger District level if the Forest Service is to meet its assigned responsibilities in the future. Obviously, it is impossible and impractical to attempt to take on additional major programs under the existing appropriation restrictions and personnel ceilings. Consequently, the Forest Service appears to have two alternative approaches that can be considered.

Alternative 1 - Maintain the present organizational structure at the Forest and District levels and conduct operations at a necessarily reduced scale pending more favorable appropriations and personnel ceilings.

Discussion: The recognized protection and development jobs on even the smaller present-day Ranger Districts are of a magnitude that--if fully financed--would create larger professional staffs on these Districts and better means to accomplish the recognized workload.

In addition, the base number of professional employees required to form more effective District units--and thus Forests--would eventually be accomplished.

Since the above cannot now be accomplished, the Forest Service could just back off and wait for more favorable times in hopes that the needed acceleration in appropriations and ceilings will eventually develop. In the interim, the volume of recognized but unfinanced workload will undoubtedly continue to accelerate and the Forests and Districts, particularly the smaller ones, will experience even greater difficulties in trying to keep up with demands. Also, the acceleration in needed appropriations may never develop.

Alternative 2 - Based on the information gathered in the Size-of-District Study and this study, the Forest Service could accelerate the careful examination of the present organizational structuring of existing Forests and Districts to capture known opportunities for increasing the effectiveness and efficiency of operations.

Discussion: Under the existing restrictions on appropriations and personnel ceilings, the Forest Service appears to have little choice but to actively seek out and implement known organizational opportunities for increasing the effectiveness and efficiency (reduce costs) of operations. The creation of Districts that can financially support at least a minimum base number of four principal District staff positions is one opportunity that must be considered.

In conjunction with the creation of larger Districts is the opportunity to create annual savings in the range of $54,000 to $139,000 for every potential consolidation of National Forests. Conversely, any annual savings that can be derived from Forest consolidations should first be used to increase District staffing to the minimum base level of four principal staff members on the respective Districts that are affected by a given consolidation of Forests.

The following recommendations concerning Size-of-Forests are based on the assumption that the Forest Service, by choice, will adopt Alternative Number 2.

Recommendation No. 1

Greater recognition should be given to the basic principle that a Forest has less chance of being fully effective until all of the Ranger Districts that make up a given Forest are first made effective by implementation of the Size-of-District Policy.

Recommendation No. 2

To create better overall District effectiveness, each and every Ranger District, wherever possible, should be of a sufficient size and so structured as to provide at least a financed workload capable of supporting four or more principal staff employees as a beginning base for effective District operation.

Recommendation No. 3

To create more effective Forests, Districts with at least the minimum base number of principal staff people for effective operation, should be grouped into Forest units. The number of Districts within the known range of 3 to 14 does not have a significant relationship, either positively or negatively, with Forest effectiveness. No maximum or minimum number **of Districts per Forest is recommended.**

Recommendation No. 4

Forests to approach an optimum level of both effectiveness and efficiency (lowest overhead costs) should be made up, wherever possible, of Districts--each with at least the minimum required level of District staffing. These should be so grouped as to create Forests with the largest adjusted budgets that local and on-the-ground socio-economic and geographic conditions will permit.

Recommendation No. 5

Initially, the creation of larger and more effective Districts should be first completed as outlined in the present "Size-of-District" policy.

Recommendation No. 6

Following the general creation of more effective Districts, consideration should be given on a case-by-case basis to the possible consolidation of contiguous Forests. These should be those instances where combining small Forests contains the most obvious potential for creating larger budgeted Forests that can operate more effectively and efficiently.

Recommendation No. 7

Generally, any annual savings created by the consolidation or restructuring of two or more Forests should be first utilized to increase the staffing on the Ranger Districts that will make up the new Forest.

Recommendation No. 8

On those Forests that are already approaching or are above an adjusted Forest budget of 3 million dollars (F.Y. 1968 base), there appears to be no reason for further upward adjustment at this time. However, these same Forests may need to continue to consider the consolidation of any Ranger Districts that fall below the recommended size in District staffing.

III. OBJECTIVE

The objective of this study is to determine the size range of National Forests that provides acceptable economies of operation while meeting Forest Service criteria for standards of effective service. This was approached by:

A. Attempting to determine if there are significant relationships between the size of a Forest and its cost of operation and effectiveness.

B. Determining, on a sample basis, the types and amounts of one-time costs which will be generally created in actual adjustments of Forest boundaries.

C. Determining, on a sample basis, the types and amounts of long term and short term savings, if any, which may accumulate as a result of the adjustment of Forest boundaries.

If the size of a Forest has a definable relationship with efficiency and effectiveness, then it should be possible to recommend a size-of-forest policy that sets guidelines for developing more efficient and effective Forest units.

IV. THE REASONS FOR CONDUCTING THE STUDY

This study was initiated because conditions are changing very rapidly in today's society. The Forest Service should keep abreast of potentially beneficial organization and management developments or changes in order to continue to be thrifty and to be fully responsive to public needs.

Two of the recommendations of the management survey team that conducted a 1965 organizational survey of the Forest Service pertain to policy regarding "Size-of-District" and "Size-of-Forest."

The Forest Service completed a Size-of-District study in 1968, and a revised policy is now being used in adjusting Ranger District boundaries.

This study attempts to examine the factors related to Forest size and evaluates their potential applications in a size policy. The recommendations will be used as a basis for determining what Size-of-Forest policy revisions are appropriate.

Because of Forest-District relationships, the Size-of-Forest study was not scheduled until the Size-of-District policy was developed.

National Forest organizational changes are frequently considered and a policy is needed to guide combinations and splits of National Forest administrative units.

V. CONCEPTUAL APPROACH

For the purposes of this report, the collection of material was done at both the Washington Office and Regional levels. The separate approach by each level is described in this section of the report.

A. Washington Office Approach. Effectiveness and efficiency are, of course, the critical considerations in structuring organizations. Efficiency is the relative cost of output over the short run, while effectiveness refers to the degree to which organizational objectives are met over the long run. For the purpose of the Washington Office portion of this study, the operating definition of the effectiveness of an organizational unit is the relative degree to which the unit is getting things done that management expects. Use of this definition requires the Regional Office staff to define, or at least ponder, its expectations and evaluate the reviewed unit's performance against these expectations.

1. Regional Questionnaire. To obtain a measure of effectiveness, a simple effectiveness rating system was used that relied on the independent judgments of Regional Office people. In each Regional Office the Regional Forester, his Deputy, Division Chiefs, and Branch Chiefs were asked to rate all of the National Forests in their Regions on an effectiveness scale of one to five. The definitions of each rating are as follows:

a. The most effective Forest in the Region (the rater must list one; may list two).

b. Above average Forest in the Region (the rater must list one; may list two).

c. Average effectiveness (the rater is requested to include in this category all Forests not listed in the other categories).

d. Below average Forest in the Region (the rater must list one; may list two).

e. The least effective Forest in the Region (the rater must list one; may list two).

Here are the assumptions in using this rating system:

(1) The people doing the rating are in a position to compare one Forest with another.

(2) It is fairly easy for each rater to identify the "best" and "worst" performers from his viewpoint, but fairly difficult to determine shades of difference between units that fall in "average" category. Therefore, the focus is on the extremes of the rating scale.

(3) The collective judgment of the people requested to rate the Forests is a rational and average measure of effectiveness. The variety in rater viewpoints should tend to balance the variety of functional and organizational activities to be considered in the comparison of performances between National Forests.

Each rater was asked his reasons for rating Forests as "most effective" and "least effective." This was done to help the rater organize his thinking in making his ratings and to inventory, to some degree, the basis for rating the Forests. The request for critical characteristics was presented to the questionnaire respondents.

2. Criteria for Analysis. A study of organizational size must be related to the criterion or criteria used to measure size. Knowledgeable Forest Service people believe that adjusted Forest budget, Supervisor's Office base workload, number of Ranger Districts or equivalent organizational units, net National Forest acreage, gross National Forest acreage, or some combination of the above should furnish an adequate measure of National Forest size. This includes almost all the variables that come up in discussing National Forest size with knowledgeable Forest Service personnel. The order of their listing represents a general consensus as to the likelihood of the variable having a relationship to effectiveness. Each likelihood must, however, be tested.

a. Budget Size. Budget size can be assumed to reflect the scale of activity on a National Forest. It tends to provide a common denominator that reflects different ways of doing business. Adjusted budget is a term used by the Forest Service to describe the planned expenditures on a Forest for a fiscal year. "Adjusted" means planned expenditures for contracting, FFF, CWFS, BD, etc., are reduced before being included in the Forest total. The adjustment is made to provide an equitable basis for distributing managerial costs.

b. Supervisor's Office Base Workload. The Forest Service has a unique and well developed system for measuring the management and support workload on each National Forest. In this system, the workload generators at the National Forest level have been identified and the amount of managerial time called "base" required by each has been determined. The Supervisor's Office and the Ranger District base workload appear to offer ways of measuring Forest size, since size can be interpreted to mean the relative quantity of the management job. One problem in using base is the measured workload on National Forests does not correlate directly with funds allotted.

c. Number of Units. Since this study is directed at the second level of the organization size, it can also be expressed in terms of the number of operating units serviced by each National Forest. This relates to the effect of span of control in limiting organizational size, a subject frequently discussed. Therefore, number of Ranger Districts and equivalent units can be compared to test span of control relationships. Equivalent units include Forest nurseries and Civilian Conservation Centers.

d. Acreage. Since the National Forests' primary mission is land management, the sheer physical size of the land mass being managed appears to be worth considering in discussing size, although there is a wide variation in the amount of work generated by an acre of National Forest land in different parts of the country. Net acreage refers to the number of acres of National Forest land within a National Forest boundary. These are the acres with which National Forest people work. Gross

acreage refers to the total acres, including National Forest land and other public and privately owned land within National Forest boundaries.

e. Productivity Indices. In all organizations, public or private, the cost of doing business is an important concern. Compared with effectiveness, one would expect that cost would be a fairly easy concept with which to deal. Of course, economy would be one of the many characteristics considered in determining whether an organization is effective, but primarily to see if it is efficient. In an industrial firm with a tangible product and the ability to evaluate the performance in terms of profit and loss, cost is easy to handle.

Some government organizations have been able to deal with cost of doing business through development of productivity measurement systems. A Bureau of the Budget publication issued in 1964 reported on efforts to develop productivity measurement methods in several Federal organizations. An unsuccessful effort was in the Bureau of Land Management in the Department of the Interior. The Bureau of Land Management has productivity measurement problems very similar to those of the Forest Service. The Forest Service has attempted to apply productivity measurement techniques, but has had reasonable success only in a few activities in a few places. Therefore, there is not available a method of determining the productivity of individual organizational units. Where products cannot be quantified, cost cannot be directly related to units of output.

f. Overhead Costs. Some general comparisons of overhead costs can be made. The second level provides management and support to the operating units. The cost of this is frequently called "overhead." In the Forest Service budgeting process, it is referred to as general expense. It includes salary and related costs for the Forest Supervisor and his deputy, staff officers and their assistants, and for the administrative officer and others in the business management

group. Also included are the costs of travel, office space, office supplies, miscellaneous supplies, and other related expenses. The costs of these support services can be compared between National Forests using percent of adjusted budget as a basis. This information was obtained from National Forest Financial Plans. These plans show the fiscal year budget for the entire Forest and the cost of general expenses at the Forest Supervisor's Office.

B. Regional Portion (conceptual approach-continued)

1. Size-of-Forest Criteria. For the purpose of this study and to get at several possible ways to rank and measure the relative efficiency and effectiveness of Forests, one Regional team developed the following various methods for indicating the relative size of Forests:

a. Supervisor's base hours + CCC (1965)
b. Supervisor's base hours (1969)
c. Adjusted Forest Budget
d. Total District budgets
e. Total District workloads
f. Net Forest acres

2. Effectiveness Criteria. Effectiveness is normally expressed as the degree to which a management unit accomplishes its stated objectives.

Although the Regional teams fully realized that the results of the Service-wide "effectiveness" questionnaire for all Forests (by Regions) would be available to them, the teams--in the interim--also sought out other ways of looking at "effectiveness" to test the findings of the Service-wide questionnaire. Theoretically, factors and measures that contribute to the effectiveness of a Forest should, for this study, be related to the size of the Forest and not to the "management styles" of the Forest Supervisor, his District Rangers, and his staffmen. Any conclusions relating to effectivensss and size must assume that competent managers are the norm, and such conclusions must be tempered with judgment, if such is not the case.

Based on the above concept, the Regional teams tried to identify other potential effectiveness measurements to either support or refute the Service-wide questionnaire findings by (1) subjectively analyzing and rating operating techniques on three sample Forests in one Region, (2) designing a "management framework" for directly comparing the operating procedures of the Forest Supervisors and their primary staffmen on the same sample Forests, and (3) ranking

the effectiveness of all Forests in Region One through a cumulative point system, and by ranking the effectiveness of all Forests in Region Three by interviewing Regional Office supervisory personnel.

a. Subjective Effectiveness Ratings of Three Sample Forests. In short, this was simply designed to be the collective opinion of the team as to which was the most effective of the sample Forests according to their size. The collective opinion was to be developed through interviewing the Forest Supervisor, all staffmen, and several District Rangers as to on what and how they spent their time on each Forest. These impressions were summarized into an effectiveness ranking for each of the sample Forests. The results are discussed in the analysis section, page 22.

b. A "Management Framework" to Measure Effectiveness. The tasks involved in managing a Forest are not as clear cut as those developed for Ranger Districts, which are essentially "doing" units. It appears that all the management tasks for a Forest which contribute to the broad objectives of the Forest Service can be categorized in several ways, all logical depending on viewpoint. The problem is to separate them into areas with definitive boundaries and at the same time areas that are fairly easy to identify for determinations of time spent and quality of accomplishment. At the same time, areas must be identified in a manner that will reflect those which are more or less constant between Forests as opposed to areas of management which can vary widely between Forests.

To further get at "effectiveness," one Regional team, before visiting sample Forests, designed a "management framework" as a possible means of looking at the effectiveness of each Forest.

In brief, this amounted to dividing the management tasks of a Forest Supervisor and his staff into four basic categories titled (1) Internal Management Tasks, (2) Direct Forest User Management Tasks (contractual), (3) Indirect Forest User Tasks (non-contractual), and (4) Socio-economic and political tasks. Then, using the 215 job descriptions contained in the "1965 Analysis of Recurrent Workload-Supervisor and Staff," a comparative time analysis was made of just how and where each Forest Supervisor

and his staffmen spent their time. An unsuccessful effort was then made to relate the time analysis study to the effectiveness of the three sample Forests. A discussion and analysis of this unsuccessful effort is contained in the Appendices, Exhibit 1.

C. Ranking of Forest Effectiveness by Regional Teams to Test the Service-wide Questionnaire

1. Region 1. In Region 1, a management analysis team identified and listed by FSM categories (1100-7100) the most important tasks that must be accomplished for effective performance at the Forest level. Then each Forest in the Region was assigned a subjective numerical rating by R.O. top management personnel as to how well the task was being accomplished. Points were accumulated for all tasks to provide a Forest "effectiveness" ranking for each Forest in the Region. The higher the total points, the lower the effectiveness.

2. Region 3. In Region 3, subjective Forest effectiveness rankings were obtained from 28 R.O. top management people and their estimates were combined into an average composite.

A comparison of both the Region 1 and Region 3 rankings with the findings of the Service-wide questionnaire are shown in the Appendices, Exhibit 2. There are minor, but not major, differences. In the opinion of the study team this indicates that it is probably impossible to get identical subjective effectiveness rankings for the same Forests by using more than one method. In addition, as people and situations change, even the repetition of the same method will not give identical results and they should not be expected.

Testing of the Region 1, Region 3, and Service-wide questionnaire methods on the same Forests at approximately the same point in time indicates an acceptable consistency in the Service-wide questionnaire findings.

3. Efficiency Criteria. Efficiency is normally expressed in terms of total cost of a unit of production, or it is the effectiveness of operation as measured by a comparison of production with cost (energy, time, money).

In the Forest Service, a variety of costs are incurred, and there are many categories of costs that may be sensitive to the efficiency of an operating Forest.

Basically, the National Forest system provides the means for the protection and development of the lands and resources assigned to the

Forest Service. We also have other areas of responsibility, such as social and economic development of both dependent locals and the national interest as a whole.

Ideally, if we could fully identify unit costs that were truly reflective of protection and development efforts, we would have an excellent means for measuring the comparable efficiency of Forests.

Practically, however, the identification of specific unit costs is difficult if not impractical or impossible at present.

a. Protection (and Maintenance) of the Resource. Protection of a resource is difficult to define in units of production because, in a sense, these are the same as units not lost to fire, insects, and disease, people impacts, etc.

   Also, the purpose of maintenance is to conserve resources (production units) allotted to future utilization. Following this line, an "acre" as a unit of production is meaningless. An acre cannot be used, either now or later, but the resource services and products of that acre can be. Yet--the present inventories we have cannot, without extreme refinement, be used to compare the resources on a given acre of one Forest to a given acre on another Forest. Consequently, units of production must be something other than the "container" within which usable resources are "stored."

   Protection may also be thought of as "not losing ground" in renewable resource inventories to destructive agents, over and above normal and expected mortality.

   Economic analysis to a highly refined degree is needed in the protection (maintenance) area and it is being initially developed in our PPB efforts. However, the Regional teams found the measurement of efficiency, as expressed in terms of valid protection units or factors (costs, ease of collection, etc.) rather meaningless, to date, except perhaps in the field of Fire Control.

b. Development of Resources. This is the investment of time, money, and energy into increasing:

   (1) The capability of a natural resource area to provide on-site services to the general public (i.e., campgrounds, picnic areas, fishing, hunting, boating, etc.).

(2) The disposable quantities of renewable natural resource products (i.e., timber, forage, wildlife, etc.) through sustained yield management and regeneration of the resources.

(3) To a limited extent, the disposability of non-renewable resources such as minerals, sand and gravel, and oil and gas.

While it appears that comparable units of cost for the above development items could be determined, the Regional teams again found that our present inventory systems are not sufficiently refined to allow for the direct comparison of unit development costs between all Forests in a Region. The units are just simply not comparable.

c. Indicators of Efficiency. Since comparable protection or development unit costs cannot be identified, other methods of looking at efficiency were examined. Briefly, these boil down to using overhead costs as a measurement of some of the factors that are sensitive to--or are indicators of efficiency.

The overall costs of doing business or the base financial cost of operating the Forest Service organization (in this specific case, the "protection and maintenance" of a National Forest), appear to provide some means of developing simplified indicators sensitive to efficiency. In this case, the measured units are not true products in that they are not disposable or even usable, as are timber or forage units.

Certain indicators sensitive to efficiency, such as costs of doing business compared to the workload, appear to be most useful. These can include such items as salary costs, travel costs and property costs. When these overhead costs are related to Size-of-Forest measurements, such as Supervisor's base and project workload, total Forest workload (including Ranger Districts), number of Districts, or budget they may provide some indicators sensitive to the efficiency of overall operation. They can be tied to a subjective effectiveness rating of a given Forest. Thus, we have a means of looking at both the efficiency and effectiveness of any given Forest.

D. Criteria for Estimating Potential Consolidation Costs and Savings

1. Estimated Costs of Adjustment Criteria. In this study, a range of estimated adjustment costs was obtained by the simulated closing of four sample Forest Supervisor Offices. The costs are based primarily on the adjustment of Forest boundaries and changes due to the closing of a Supervisor headquarters in each case.

2. Estimated Savings after Adjustment Criteria. In this study a range of estimated savings was obtained by a combination of estimating:

(a) Potential savings in general expenses due to the simulated creation of larger organization units.

(b) Potential maximum and minimum savings in base workload allowances by the simulated consolidation of Forests of variable sizes.

(c) Potential savings by use of a model to simulate the consolidation of a sample Forest Supervisor's Office with another.

VI. ANALYSIS OF DATA GATHERED

A. Effectiveness Ratings

1. Regional Questionnaires Collected by the Washington Office. Each Forest was rated by 30 to 40 people. Effectiveness rating questionnaires were distributed to all Regional Foresters, all Deputy Regional Foresters, all Regional Office Division Chiefs (Assistant Regional Foresters or equivalent) and all Regional Office Branch Chiefs. Over 95% of the questionnaires were returned, for a total of 343. In 10 cases, blank questionnaires were returned because the respondents felt they were too new in their jobs to give adequate ratings. Respondents were asked to make their ratings individually and without consulting with anyone else. It would be natural to assume that each rater looked at the performance of a given National Forest from the viewpoint of his specialty in addition to considering whether the Forest was meeting overall objectives. As expected, agreement between evaluators was far from unanimous. But there was a statistically significant consistency.

A chi square test was made to compare the ratings given the highest, lowest, and closest to average rated Forests in each Region by each of the raters. This showed independence between the ratings is rejected at the .005 level. This means that the consistency of

the raters in selecting high and low Forests could occur by pure chance less than five times out of a thousand. This shows a rather substantial consistency for the effectiveness measure. The results of the tests for each Region are shown in Table 1.

TABLE 1

SUMMARY OF CHI SQUARE TESTS OF THE INDEPENDENCE OF HIGH, LOW AND AVERAGE EFFECTIVENESS RATINGS OF NATIONAL FORESTS IN EIGHT FOREST SERVICE REGIONS

Region	x2	Level of Significance (df=8)
Northern	68.44	.005
Rocky Mountain	49.20	.005
Southwestern	101.75	.005
Intermountain	86.34	.005
Pacific Southwest	74.31	.005
Pacific Northwest	115.55	.005
Southern	30.02	.005
Eastern	94.80	.005

Each rater was asked to state the reasons for his highest ratings, and his lowest ratings. Responses are summarized in Tables 2 and 3.

In trying to determine some of the reasons for the size-effectiveness relationships, it is of some interest to review the reasons given by the raters for rating Forests in the high and low categories. As could be expected, the most popular positive effectiveness factor is generally efficient and effective performance. However, this is rather meaningless because it means nothing to rate a Forest "effective because it is effective." The other factors listed are more specific and perhaps more useful. The second most popular factor, good teamwork and cooperation, is the reflection of effective management by the Forest Supervisor and/or his subordinates. It could also be the result of a unit having a large enough workload to staff with a solid management team. The third listed item, sensitivity to social and economic needs and the changing role of the Forest Service, also appears to be a reflection of the overall competence of the Forest Supervisor and his staff. It could also be a reflection of an outlook on management developed in response to the local environment.

Since 95% of the respondents had staff responsibilities for a specialized area of activity, it might be expected that the ability of the Forest to handle the particular specialty would be weighted very heavily in determining effectiveness. However, only a small percentage considered this a factor significant enough to make specific comments about it. The number of people who rated large size as a

TABLE 2

POSITIVE EFFECTIVENESS FACTORS

Factors identified as contributing to effectiveness	All Raters		Regional Office Division Chiefs and Above	
	Number	Percent	Number	Percent
Generally efficient and effective	102	26	25	24
Good teamwork	59	15	14	13
Sensitive to socio-economic needs and changing role of the Forest Service	56	15	19	18
Large workloads and adequate financing	40	10	18	17
Strong emphasis and attention in the functional area	39	10	3	3
Dynamic organizational climate	28	7	6	6
Outstanding personnel	23	6	6	6
Important land resources	11	3	4	4
Good land ownership situation	10	3	4	4
Small size, easily managed	8	2	1	1
The Forest is a major contribution to the local economy or rates high as a conservation leader	5	1	2	2
Other	5	1	3	3
	386	99	105	101

TABLE 3

NEGATIVE EFFECTIVENESS FACTORS

Factors identified as contributing to ineffectiveness	All Raters		Regional Office Division Chiefs and Above	
	Number	Percent	Number	Percent
Generally not as efficient or effective as others	80	23	18	19
Insufficient Size	56	16	23	25
Poor teamwork	44	13	12	13
Organizational climate not dynamic	39	11	6	7
Lack of emphasis in a functional area	38	11	3	3
Not as sensitive to socio-economic needs	25	7	9	10
Quality of personnel	15	4	2	2
Poor Land Ownership Pattern	15	4	6	7
Only one or two major natural resources	8	3	3	3
Span of control too wide	8	3	2	2
Tendency to let one resource dominate	5	2	0	0
Other	15	4	8	9
	348	101	92	100

positive effectiveness factor is also small. Some significance may be attached to the fact that only eight listed small size as a positive effectiveness factor, while 40 listed large size. At least, in the opinion of those who responded to these questionnaires, large size is much more likely than small size to contribute to the effectiveness of a unit.

In many cases questionnaire respondents listed as a negative effectiveness factor the converse of the listed positive effectiveness factors, but this did not happen every time. A lower degree of **efficiency and effectiveness was the most commonly listed item.** This squares with the positive effectiveness factor listing. Small size as a negative effectiveness factor appeared more frequently than did large size as a positive effectiveness factor. A small percentage listed large size as a negative effectiveness factor equaling the number who listed small size as a positive effectiveness factor.

In general, the data suggests that Regional Office personnel making effectiveness ratings tend to believe the larger National Forests are likely to be more effective than smaller National Forests. Size is considered to be more of a negative factor than a positive factor. That is, small size has a greater probability of making a Forest ineffective than large size has of making it effective. A Forest of any size can be effective if it has a good management team, but being small makes it more difficult.

Now let us look at just those reasons for effectiveness ratings listed by Regional Office personnel highest in the management hierarchy. This includes Regional Foresters, Deputy Regional Foresters, and Regional Office Division Chiefs (Assistant Regional Foresters). One would expect some differences in ratings between this group and Branch Chiefs. Each has a considerably broader area of responsibility than the Regional Office Branch Chiefs who comprise the rest of the group of raters. In this top management level size comes across as a much stronger factor. This group is more inclined toward believing that a large Forest is more likely to be more effective than a small Forest. A chi square test of the difference between the two groups results in x^2 values of 24 and 28 (df = 11). This shows independence was rejected at the .05 level or better in each case.

2. Regional Observations on Effectiveness Ratings. Three sample Forests were selected for study by one Regional team. These were picked because they had already been selected by the UCLA study team for evaluation in their study, "Organizational Phenomena in the Forest Service," and it was thought that data from both studies would eventually provide data that can be used as indicators of effectiveness on these Forests. Based on the 1965 "Supervisors' Base Workload," plus 1968 "Job Corps Managerial Workload," the Forests rank within the 12 Forests in the Region as follows:

Forest	1965 Measured SO Workload Hours	Regional Size Rank	Number and Size Ranger Districts
A	20,149	2	7 (4 GS-12; 3 GS-11)
B	14,642	8	8 (all GS-11)
C	*13,242	9	4 (1 GS-11; 3 GS-12)

* Includes 1530 estimated hours of Civilian Conservation Center managerial time.

As a working hypothesis, the Regional team assumed the Size-of-a-Forest as expressed by the Supervisor's workload could be an indicator of effectiveness. Thus, the ranking of Forests according to size might show either a positive or negative relationship to the effectiveness ranking of these same Forests.

Therefore, if Forests A, B, and C had size rankings of 1st, 2nd, and 3rd, then their effectiveness might also have a 1st, 2nd, and 3rd relationship, or inversely--a 3rd, 2nd, and 1st relationship.

The information collected by the Regional team interviews did not substantiate the hypothesis--either positively or negatively. Rather, the team's observations indicated the effectiveness of Forest A and C (largest and smallest sample Forests) both exceeded the effectiveness of Forest B.

Since the hypothesis did not appear to stand up on the sample Forests, the data was further analyzed to try to determine "why." The following pertinent points appeared to be significant:

a. The Forest Supervisor and the majority of the staffmen on Forest A (largest) were almost unanimous in pointing out the high degree of effectiveness on the larger GS-12 Districts. In short, they said they have to spend considerably less time trouble shooting on the larger Districts, and can devote the required staff time to the training and inspection tasks as needed.

   Interviews with the District Rangers on three of the GS-12 Districts strongly confirmed the Supervisor and staff observations. The District Rangers also noted there appears to be a strong factor of synergism, or competitive pride, developed between employees of similar stature on the larger Districts

and this spirit of competitiveness carries over into greater competition between professional employees on other Districts.

b. The Forest Supervisor and staff on Forest C (smallest) were also unanimous in again pointing out the greater effectiveness of the larger and properly staffed Ranger Districts (3 GS-12, 1 GS-11, and 1 Civilian Conservation Center on Forest C).

There is, however, some indication the primary GS-12 staffmen on Forest C are doing considerable GS-7 and GS-9 tasks. Staff service to the Districts appears to be satisfactory. Yet, there is some indication that since there are only four Ranger Districts on Forest C (8 on A and 7 on B) the primary staff officers could handle additional Ranger Districts without losing any significant degree of their present effectiveness and gain some efficiency.

c. In general, the effectiveness of the Forest Supervisor and staff on Forest B appears to be significantly less than Forests A and C. The Forest Supervisor, staffmen, and District Rangers are apparently working just as hard and long hours. Yet, there appears to be an air of less accomplishment, almost one of frustration, in effective job accomplishment. There are indications the primary staffmen are spending considerable time on jobs that should be done by District personnel on a well-staffed District. The two District Rangers interviewed expressed strong sentiments to the effect that since they did not have enough fully qualified staff on the District, there is a tendency for the Forest Staffmen and District Rangers to get into the production details by necessity. The Rangers also said they would like larger District units so they could better organize the available manpower resources to do the production job.

d. Also at the time the Regional study team visited the sample Forests, the staffing of each Supervisor's organization was as shown in the Appendices, Exhibits 3, 4, and 5.

A review of Exhibits 3, 4 and 5 shows a Forest Supervisor's primary staffing in the sample Region

is not necessarily a direct reflection of the financed Supervisor and Project Management Workload. Rather, the Regional Forester and Forest Supervisor annually agree on the Base and Project Management staffing. Consequently, a Forest may be either understaffed or overstaffed to some limited degree if compared to the financed Base and Project Management Workload. For example, in F.Y. 1970, Forest A (largest) was theoretically understaffed by 3.2 man-years. Forest B was within .2 of a man-year of financed staffing (a sub-staff position was also doing some base staff work), and Forest C (smallest) was theoretically overstaffed by .6 of a man-year. This indicates that by choice, and probably unconsciously, the Regional Forester and Forest Supervisors recognize an inherently greater effectiveness in larger Forests and less in smaller units (reduced staffing would also reduce overhead costs and tend to increase efficiency on any Forest).

There are obviously many other contributing factors to this variance, but one factor was continually emphasized during the interviews. The relative effectiveness of a Forest Supervisor and staff is a direct reflection of the cumulative effectiveness (accomplishment of objectives) of the Ranger Districts on each unit. Further, the effectiveness of the individual Ranger District is significantly higher on the larger Ranger Districts, and appears to be the direct result of providing the District Ranger with at least a minimum number and level of competent and highly trained technical staff and clerical people to fully support him. Then, the District Ranger can be free to concentrate on the on-the-ground training, inspection, coordination, and trouble-shooting tasks that contribute so much to accomplishment.

The Regional study team completed its Sample Forest observations and analysis on January 17, 1969. On January 30, 1969, they obtained the effectiveness rankings for the sample Forests as determined by the Washington Office questionnaire to each Regional Branch Chief, Division Chief, Deputy Regional Forester, and Regional Forester.

The corresponding effectiveness rankings collected by the W.O. questionnaire show:

Sample Forest	WO Effectiveness Ranking	Questionnaire Rating (1-5)
A	1	4.16
C	3	3.45
B	6	3.17

(Note: 12 Forests considered in ranking)

The above subjective effectiveness ranking corresponds to a degree with the Regional study teams' subjective findings on the sample Forests. Since the primary reasons for the apparent correlation of these effectiveness rankings may be a cumulative reflection of the average size of workload on the Ranger Districts on each unit, the Regional team analyzed these concepts further for all Forests in the same Region as shown in Section VI-B-2, page 33 (size compared with effectiveness).

B. Size Compared with Effectiveness

1. Washington Office Observations. The most significant consideration with regard to size measures is not related to this question: "Which factor is the best measure of size?" Rather, it is "Which factor or combination of factors which differentiate between organizational units can be used to predict effective or ineffective performance?" Therefore, seven of the possible Washington Office determined size factors were related to effectiveness in multiple regression analysis. A problem in making this comparison is the fact that each evaluator was only able to rate for effectiveness the Forests within his Region. Thus, the rating a Forest receives can be compared only indirectly with the rating received by a Forest in another Region. Also, the range of size classes varies between Regions. A Forest of a given size by any measure may be among the largest in one Region, an average sized Forest in another, and in a smaller than average group in another Region. Because of the independence of all the variables between Regions, some kind of common size measure is needed. This was developed by giving a relative size rating to each Forest within a Region in much the same way that questionnaire respondents were asked to rate Forests for effectiveness. The largest sized Forest in a Region was given a rating of one. If there were two Forests that came close to being nearly the same size, they were each given a rating of one. The one or two Forests in the next largest size category received a rating or ratings of two. The very smallest one or two Forests in the Region were rated as five. The one or two Forests slightly above the smallest size category were rated as four. All other Forests were considered to fall in the "average" range, and were rated as three.

This form of common denominator or category type rating was applied to all Forests for two size variables; adjusted budget and measured Supervisor's office workload. This was not done for the other size variables. In these, the differences in the size range between the Regions is not as pronounced.

In summary, each National Forest is identified by the following characteristics related to size:

Adjusted budget 1968
Supervisor's office measured base workload
Number of Ranger Districts or equivalent units
Adjusted budget category (factor of 1-5)
Supervisor's office measured base workload category
Net acreage
Gross acreage

Using multiple regression, the above seven independent size variables were compared with average subjective effectiveness ratings to determine whether any of them or any combination of them, could indicate effectiveness. The analysis showed that all of the seven variables considered together have a statistically significant correlation (.01 level) with average effectiveness. The correlation value is .49.

In examining the correlation between adjusted budget category and average estimated effectiveness, it becomes evident that there are some marked differences between eastern and western Regions in the way the data behaves. The differences between the six western Regions and the two eastern Regions are shown graphically in Figure 1.

Because of this apparent difference, a similar multiple regression analysis was made of the six western Regions in a group and of the two eastern Regions in a group. The correlation was not statistically significant for the two eastern Regions (.05 level). However, grouping the data strengthened the correlation for the six western Regions (.01 level). The correlation value is .57.

FIGURE 1

NATIONAL FOREST AVERAGE EFFECTIVENESS COMPARED WITH ADJUSTED BUDGET SIZE CATEGORY

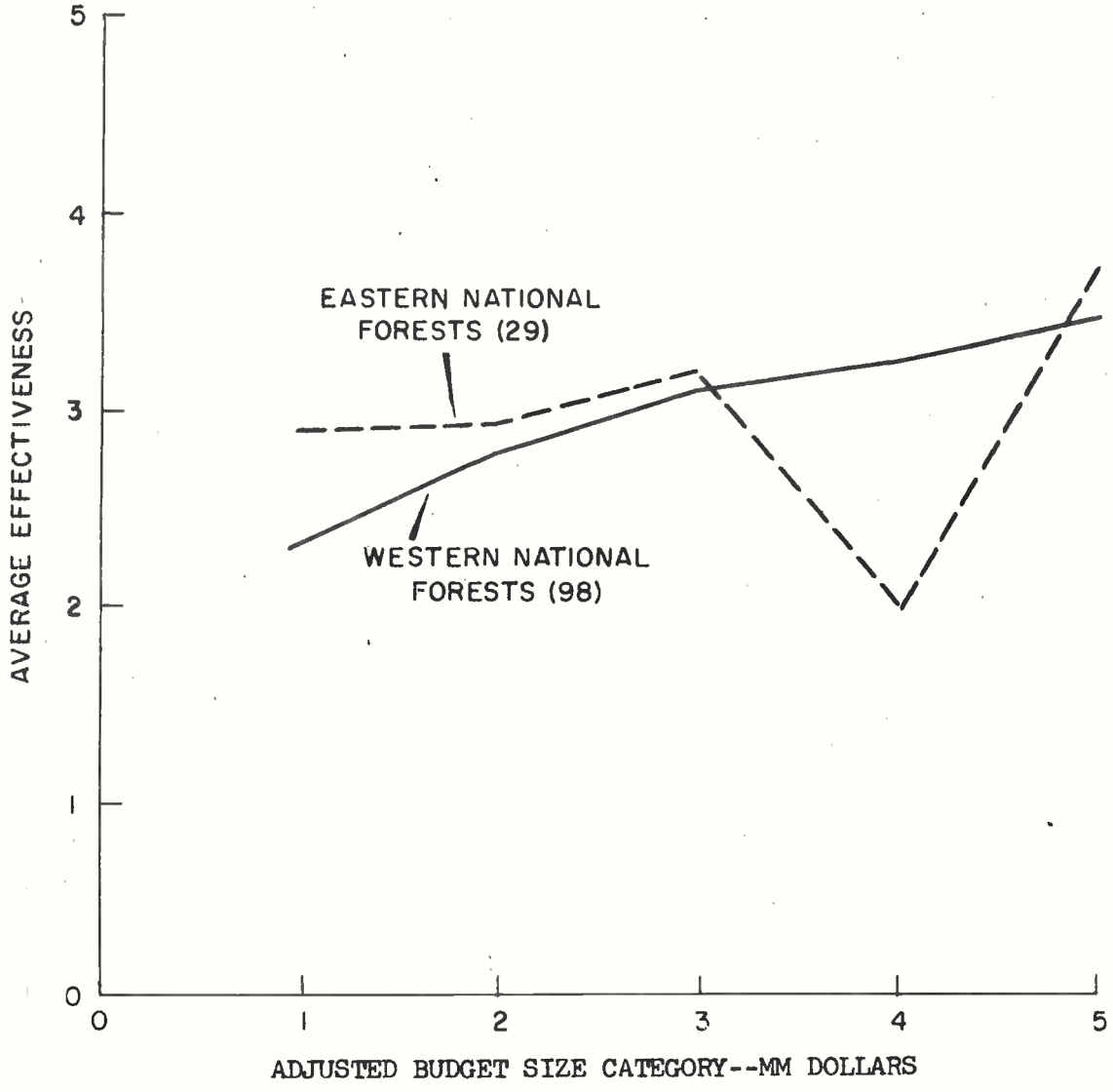


Table 4 summarizes the correlations between each of the seven independent variables and average effectiveness in the six western Regions. Individual variables were not examined for the two eastern Regions because of the lack of correlation found when all variables were considered together.

TABLE 4

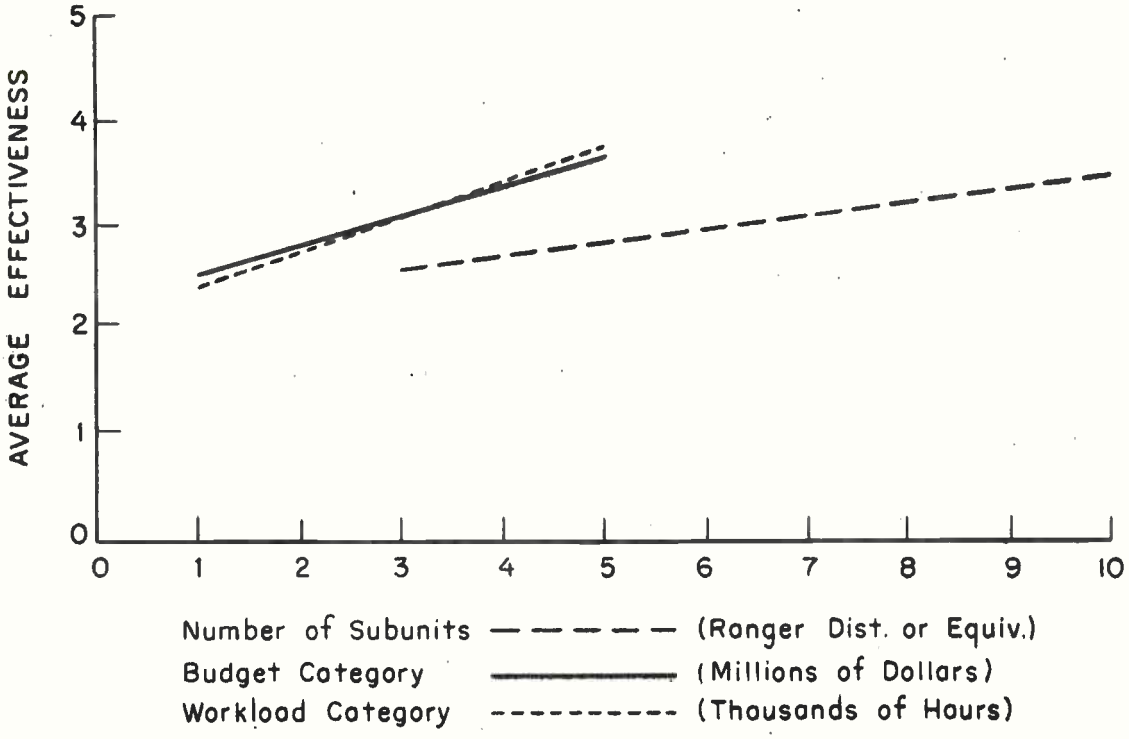
SIZE RELATED VARIABLES COMPARED WITH EFFECTIVENESS IN THE SIX WESTERN REGIONS (98 NATIONAL FORESTS)

Variable	Correlation	F value	Significant at .05 level	Significant at .01 level
Adjusted Budget	.18	3.29	No	No
Supervisor's Office Base Workload	.12	1.44	No	No
Number of Subunits	.38	16.49	Yes	Yes
Adjusted Budget Category (Factor of 1-5)	.49	29.90	Yes	Yes
Base Workload Category	.49	30.28	Yes	Yes
Net Acreage	.02	.03	No	No
Gross Acreage	.13	1.70	No	No

The relationship between average effectiveness and the significant size variables is shown graphically in Figure 2. All of the variables show a positive correlation with effectiveness. This suggests that within a western Region, Forests of a larger size by any of the measures have a significantly greater chance of being effective than does a smaller Forest. Combining variables would increase the correlation but not to a great degree. This is because the significant variables are closely associated with each other and generally measure the same thing. There is very little difference between budget and measured workload in their relationships with effectiveness. There is also a strong positive correlation between number of subunits and the other variables. That is, the general pattern in most Regions is that Forests with larger budgets tend to have a larger number of subunits. Of the three variables, number of subunits has the weakest correlation. Measured Supervisor's office workload is usually not as current as adjusted budget and is conceptually more difficult to grasp. Therefore, adjusted budget was selected as the critical size variable and used in subsequent analyses.

FIGURE 2

THE RELATIONSHIP BETWEEN AVERAGE EFFECTIVENESS AND SIGNIFICANT SIZE VARIABLES.



There is at least one other way of looking at size-effectiveness relationships. This deals with obtaining the answers to these questions: "If a Forest is in the largest size category in a Region, what percentage of Regional Office raters will give the Forest a high effectiveness rating? A low rating? What if it is the smallest Forest?" The answers to these questions are found in Table 5. Because there appeared to be differences in size-effectiveness relationships in the eastern Regions as compared with the western Regions, the two areas are listed separately.

TABLE 5

SIZE CATEGORY COMPARED WITH THE PERCENTAGE OF RATINGS RECEIVED IN EACH EFFECTIVENESS CATEGORY

Size Category	Effectiveness Category 5 (highest)	4	2	1 (lowest)	Tendency
	Percentage of Ratings Received				
Eastern Regions					
5 (Largest)	23	28	8	0	←
4	2	8	16	28	→
2	12	13	7	2	←
1 (Smallest)	6	19	18	12	→
Western Regions					
5 (Largest)	23	22	4	5	←
4	16	13	5	11	←
2	6	9	10	8	→
1 (Smallest)	3	3	24	21	→

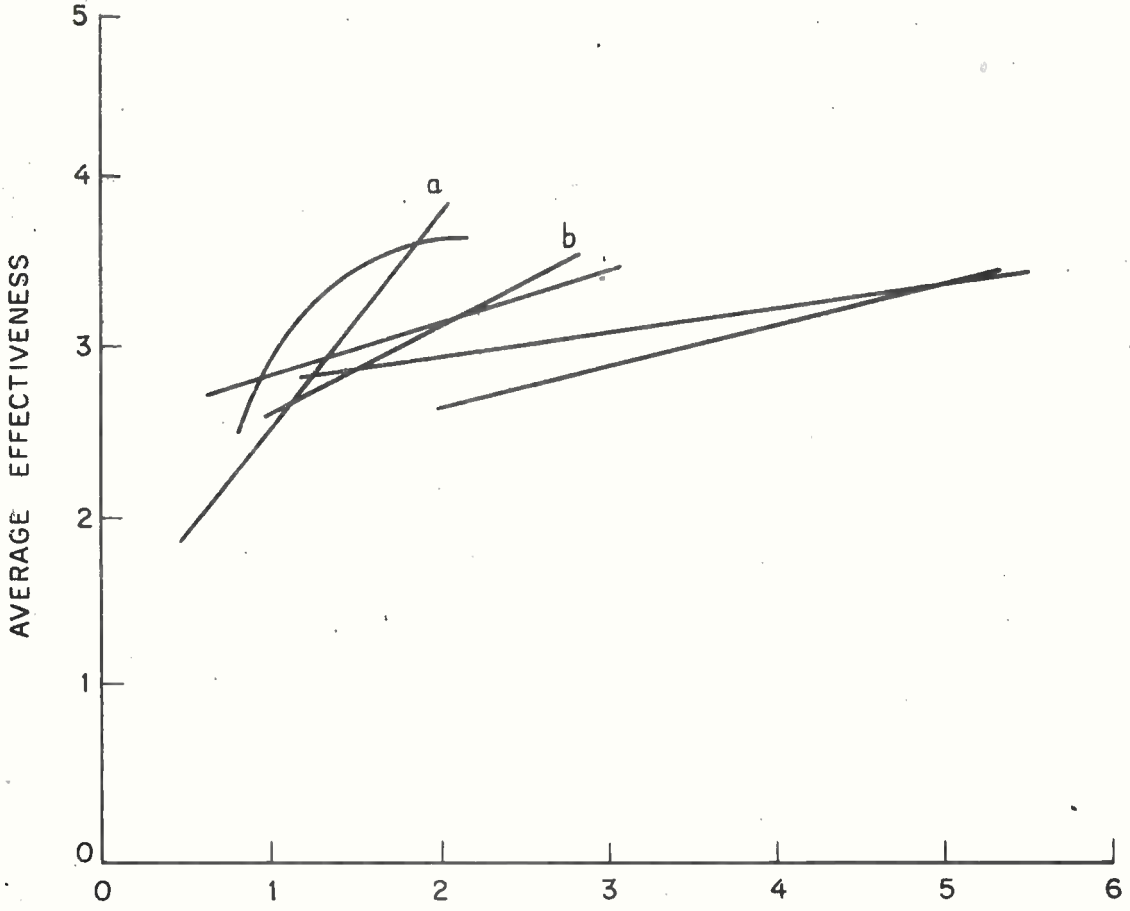
This shows a general pattern that larger National Forests tend to receive a greater proportion of higher effectiveness ratings than do the smaller Forests. This pattern was more consistent in the West than in the East.

Comparing average effectiveness to actual adjusted budget dollars in individual western Regions shows a pattern of size effectiveness relationships. Figure 3 illustrates this. In five of the Regions the relationship is approximately linear and the lines shown were computed by the least squares method. In the sixth, the relationship is curvilinear and the curve was drawn and balanced by hand. The lines extend over the size range of National Forests in the particular Region.

An examination of the curves in Figure 3 shows a higher degree of correlation between effectiveness and budget size in Regions with small to medium sized Forests, than there is in Regions with medium

FIGURE 3

EFFECTIVENESS COMPARED WITH ADJUSTED BUDGET DOLLARS FOR NATIONAL FORESTS IN EACH OF THE SIX WESTERN REGIONS.



[a] Significant at .01 level.
[b] Significant at .05 level.
All others not significant at .05 level.

to large sized Forests. The lines slope much more steeply at the lower end of the adjusted budget scale. There is a similarity in the general slope and shape of the curves for the Regions with the smallest National Forests. A medium sized National Forest (two to three million dollars) is likely to receive a very favorable effectiveness rating compared with a National Forest whose budget is about one million dollars or less. A National Forest with a budget of four to five million dollars is likely to receive a higher effectiveness rating than a National Forest in the medium sized range, but the difference in this case is smaller.

This also suggests that as the adjusted budgets of Forests within a Region exceed two to three million dollars (F.Y. 1968 base year), there is less agreement among raters and hence each Forest tends to average out closer to the center value because there is a low spread in effectiveness ratings. Consequently, the significance of the relationship between effectiveness and adjusted budget size apparently tends to diminish with increasing budget size.

Considering effectiveness only, a Forest with a size greater than two to three million dollars is not suffering greatly from operating problems associated with small size. Forests with adjusted budgets (F.Y. 1968 base year) of about one million dollars or less are more likely to have such problems. There may be diseconomies of scale if the size range could be extended beyond that currently existing, but we do not have any data to support such an extension. Consequently, there is an indication only that within the present size range of Forests, medium size Forests tend to be significantly more effective than small Forests, and large Forests tend toward having a better chance at being effective than medium sized Forests. Also, the data does not indicate if an upper limit on size-effectiveness has been attained by large Forests to date.

The linear regression charts in the Appendices--Exhibit 6--further illustrate the general positive tendency that larger adjusted budget Forests have a better chance of being more effective than smaller adjusted budget Forests.

2. Regional Observations (Size vs. Effectiveness). Based on the preliminary information collected on sample Forests, and because there seemed to be apparent correlation between Regional observations and Washington Office (questionnaire) effectiveness rankings, the following relationships for all Forests in one Region were further examined:

a. Forest effectiveness ratings from the Service-wide questionnaire were arrayed to Forest size factors (S.O. workload).

b. Forest effectiveness ratings from the Service-wide questionnaire were arrayed to average size of Ranger Districts.

Chart 1 illustrates the relationship of Forest effectiveness to Forest size (S.O. workload) in one sample Region. Forest effectiveness rankings were plotted on the vertical or Y coordinate, and Forest sizes (S.O. workload) expressed as a factor were plotted on the horizontal or X coordinate. The solid horizontal line is the average of the effectiveness ratings for all Forests in the Region, and the solid vertical line is the average of all Forests' S.O. workloads expressed as a factor in the same Region. The slanted line is a regression line showing a positive relationship between Forest effectiveness and Forest size.

The solid vertical and horizontal lines also divide Chart 1 into quadrants that assist in interpretation. To illustrate---

a. Forests falling in Quadrant I are above the Regional average in effectiveness but below average in S.O. workload size.

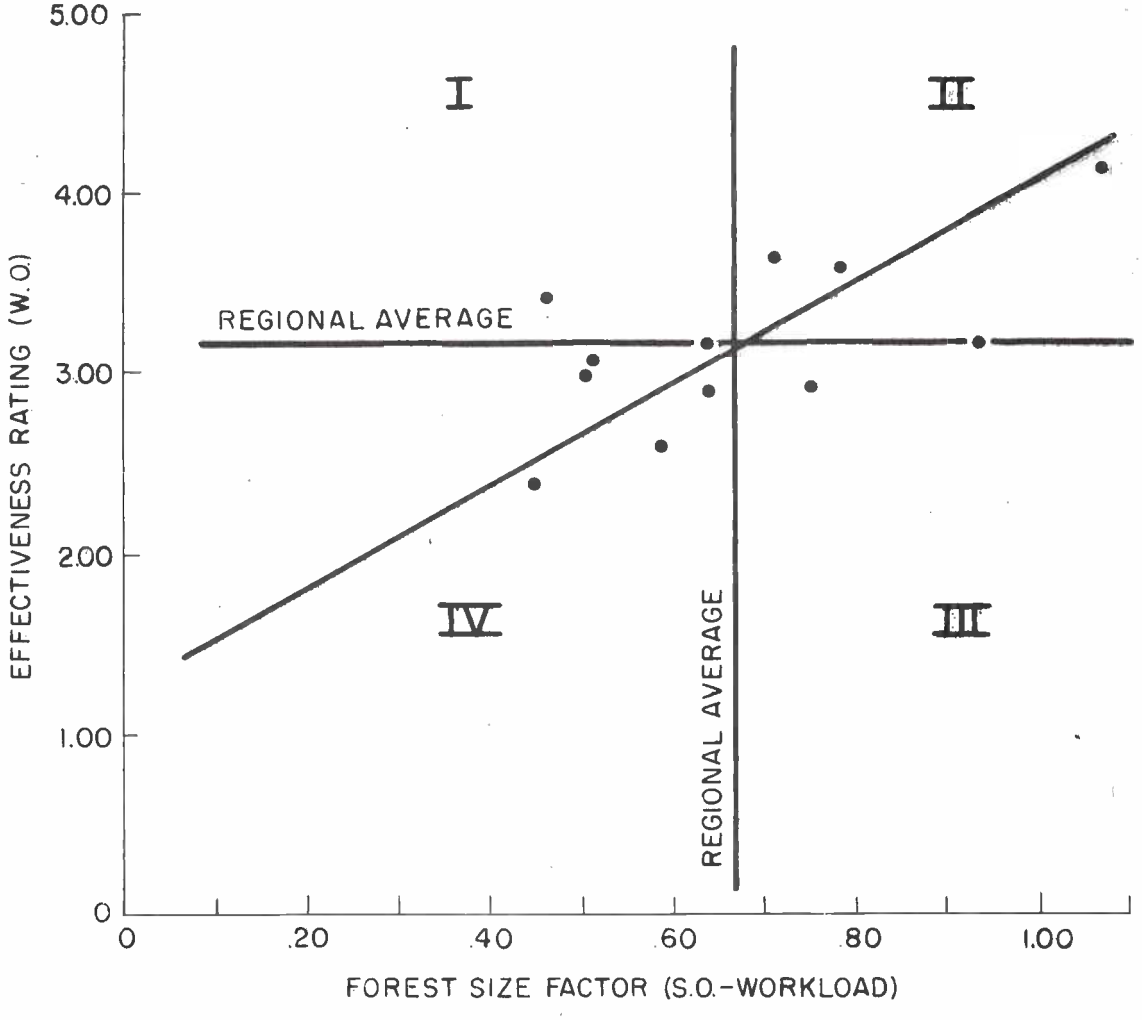
b. Forests falling in Quadrant II are above the Regional average in both effectiveness and S.O. workload size.

c. Forests in Quadrant III are below average in effectiveness but above average in S.O. workload size.

d. Quadrant IV shows Forests below average in both effectiveness and size.

CHART I

EFFECTIVENESS RATINGS ARRAYED TO FOREST SIZE FACTOR IN ONE SAMPLE REGION



Three of the four Forests with effectiveness ratings above Regional average are above Regional average in size. Five of the six Forests with effectiveness ratings below Regional average are of smaller than average Regional size.

Seventy-one percent of smaller Forests are less effective. Sixty percent of larger Forests are more effective.

	Eff.		Size
Smaller Forests average	= 3.0	More effective average (4 Forests)	.76
Larger Forests average	= 3.5	Less effective average (6 Forests)	.58

The Regional team initially attempted to further relate Forest effectiveness to actions occurring at the Forest Supervisor's office level. Yet--the most promising avenues for determining Forest effectiveness led back to the District as the primary effectiveness building block. In short--Forest effectiveness could be an accumulation of District effectiveness.

Chart 1 shows a positive relationship between Forest size and effectiveness ratings in the sample Region. Since there are strong indications that effectiveness may be influenced more by the size of the Ranger Districts that make up a Forest, Chart 2 is designed to array Forest effectiveness ratings and average District size of a Forest expressed as a factor. The design is identical to Chart 1 except that the solid vertical line is the average size of Districts in the sample Region expressed as a factor for charting purposes.

To further illustrate Chart 2:

a. No Forests fell in Quadrant 1, but the Quadrant would indicate Forests with above average effectiveness but below Regional average District size.

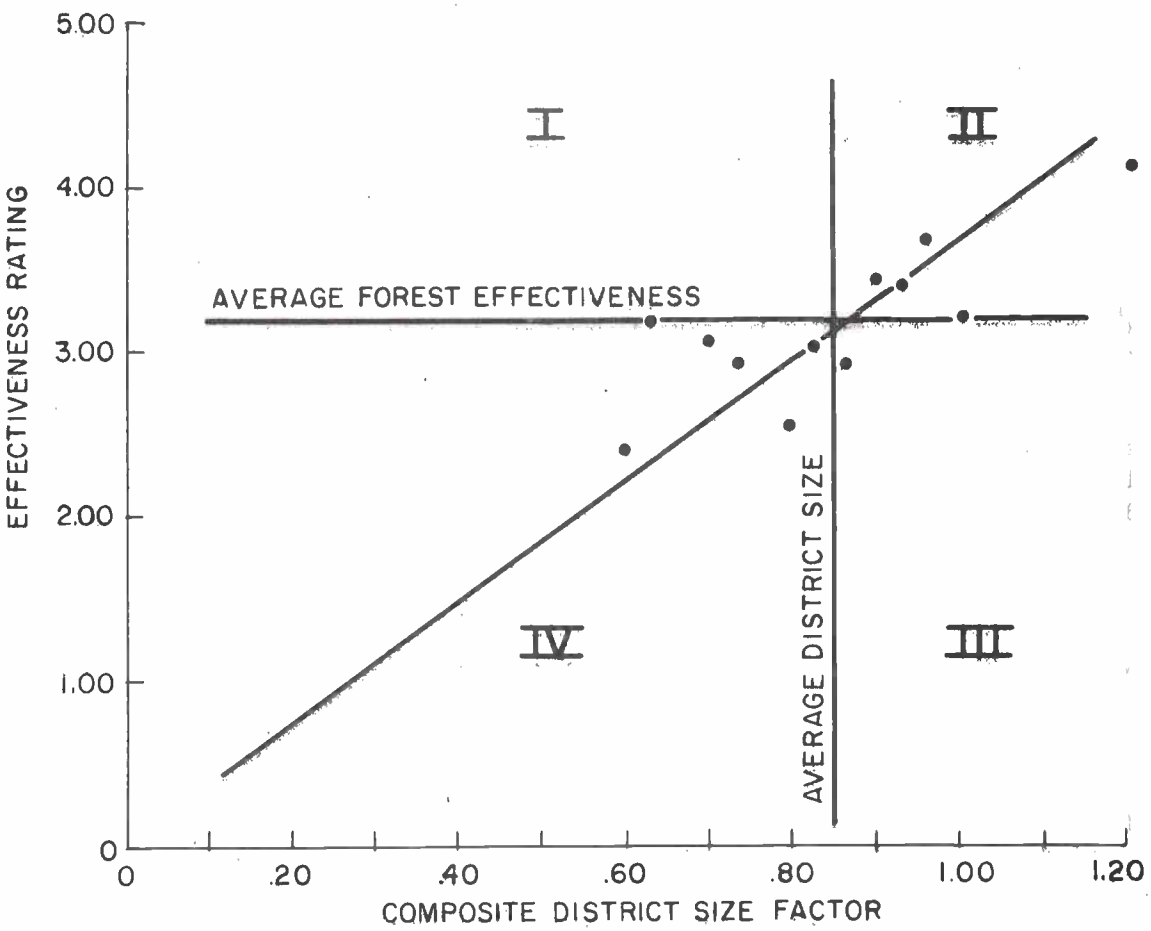
b. Quadrant II indicates number of Forests (4) with above average effectiveness ratings and above average Regional District size in the sample Region.

c. Quadrant III indicates number of Forests (2) with below average effectiveness ratings and above average Regional District size in the sample Region.

d. Quadrant IV indicates number of Forests (6) with below average effectiveness ratings and below average Regional District size in the sample Region.

CHART 2

EFFECTIVENESS RATINGS ARRAYED TO COMPOSITE DISTRICT SIZE FACTORS IN ONE SAMPLE REGION



Quadrant II - All of the four Forests with above average effectiveness ratings are above average in composite District size - 100%. Five of the six Forests with effectiveness ratings below average have Districts smaller than average Regional District size - 83% (Quadrant IV).

This indicates that average composite District size is a significant factor in the effectiveness of a Forest in the sample Region. Eighty-three percent of smaller District Forests are less effective. Sixty-seven percent of larger District Forests are more effective than average.

	Eff.		Size
Smaller District Forests average =	2.9	More effective average =	1.01
Larger District Forests average =	3.5	Less effective average =	.76

The narrative at the bottom of Chart 2 further explains the apparently strong positive relationship between Forest effectiveness ratings and average District size (workload) in the sample Region. Forests with a larger average District size appear to have rather consistently higher effectiveness ratings.

Since there appears to be a positive relationship between average District size and Forest effectiveness ratings in the sample Region, other Regions were analyzed to see if the same relationship may exist.

The linear regression charts in the Appendices - Exhibit 7 - were then developed for all Regions relating Forest effectiveness ratings to the average District size for each Forest. District size was initially expressed by the Size-of-District formula. This analysis suggests that there are varying degrees of positive correlation between Forests with larger average size of Districts (from Size-of-District formula) and Forest effectiveness ratings in all Regions except 2, 4, and 5. However, since the Size-of-District formula for measuring District size is influenced by several factors, the expression of District size in other manners may provide additional insights.

In reality, when we get indicators that larger Districts may contribute toward increased Forest effectiveness, we are probably trying to measure a symptom rather than the cause of the increased effectiveness. Practically, increased effectiveness cannot come from just making organizational subunits larger. It has to also have some relationship with the dynamics of placing competent people within a work environment that encourages people to work cooperatively but yet competitively. The Regional teams' observations on the sample Forests noted much greater synergism, or competitive pride, in the groups of professional substaff employees on larger Districts. They were not only competing with each other, they were learning from each other. They were also highly competent and qualified specialists in their assigned fields.

Another contributing factor to District effectiveness appears to be the creation of conditions that allow the Ranger to better concentrate his efforts in the critical and sensitive management areas because he has a staff to do the functional detail work. In addition, if the workload is such that each principal substaff District employee is assigned only one - possibly two - functional areas, he

can concentrate on doing high quality professional work of a repetitive nature and increased production (accomplishment) is the natural result. Fundamentally, this is the old scientific management approach of dividing the work into specialized tasks so individuals can gain dexterity through repetition.

The Size-of-District Study suggests that generally Districts with four or more principal staff employees tend to be more effective than those with fewer than four. Field study findings also indicate the importance of delineating boundaries of a Ranger District so as to encompass enough of any given function to occupy the major portion of a staffman's time.

Consequently, the number of professional principal staff employees per District per Forest related to Forest effectiveness ratings may be a more significant way of relating District size to Forest effectiveness.

Briefly, the Ranger Districts in each Region show the following staffing pattern:

Region	Average number of principal staff per Ranger District (includes DFR but excludes technicians and new trainees)
1	3.99
2	2.72
3	3.00
4	2.38
5	5.27
6	5.16
8	3.21
9	3.76
10	(excluded)

The linear regression charts in the Appendices - Exhibit 8 - further show the relationships of District size (staffing) to Forest effectiveness for each Region. The most positive relationships are in Regions 3 and 5. Less positive relationships exist in Regions 1, 2, and 6, and no relationships exist in Regions 4, 8, and 9. However, there is nothing to indicate a strong negative relationship in any Region between increased District principal staffing and Forest effectiveness.

C. Size Compared with Overhead Costs

1. Washington Office Observations. Examination of the relative efficiency of National Forests of various sizes was limited to comparison of the percent of total budget allotted to Supervisor's office general expense on each National Forest and relating this to size. It was assumed that this percentage would indicate the ability of a National Forest to put money on the ground in activities directly tied to natural resource management. General expense was calculated from fiscal year 1968 financial plans of each of the 127 National Forests sampled. Because of differences in handling office space costs, this item was dropped from all budgets for the sake of uniformity. The relationship is shown graphically in Figure 4, page 40.

Figure 4 shows that the percentage of the total budget that must be held to give management and support to National Forest activities declines substantially as size increases. The slope of the trend is less steep as size increases, finally leveling off at about 10 percent. The cost advantage of a given increase in size is much greater for smaller National Forests. And for Forests with annual adjusted budgets above three million dollars, there is practically no cost advantage for general expense associated with increase in size.

2. Regional Observations (Size vs. Cost). The following is an analysis of 12 National Forests in one sample Region to see how well overhead costs may be indicators of efficiency on various size Forests.

The Supervisor's workload is one of the most common and agreed upon methods for expressing Forest size. The costs of staffing the Supervisor's workload - when related to a Forest's size - may be used as an indicator of efficiency.

However, to graphically relate size to indicators of efficiency requires the expression of both Forest size and staffing costs in factor forms.

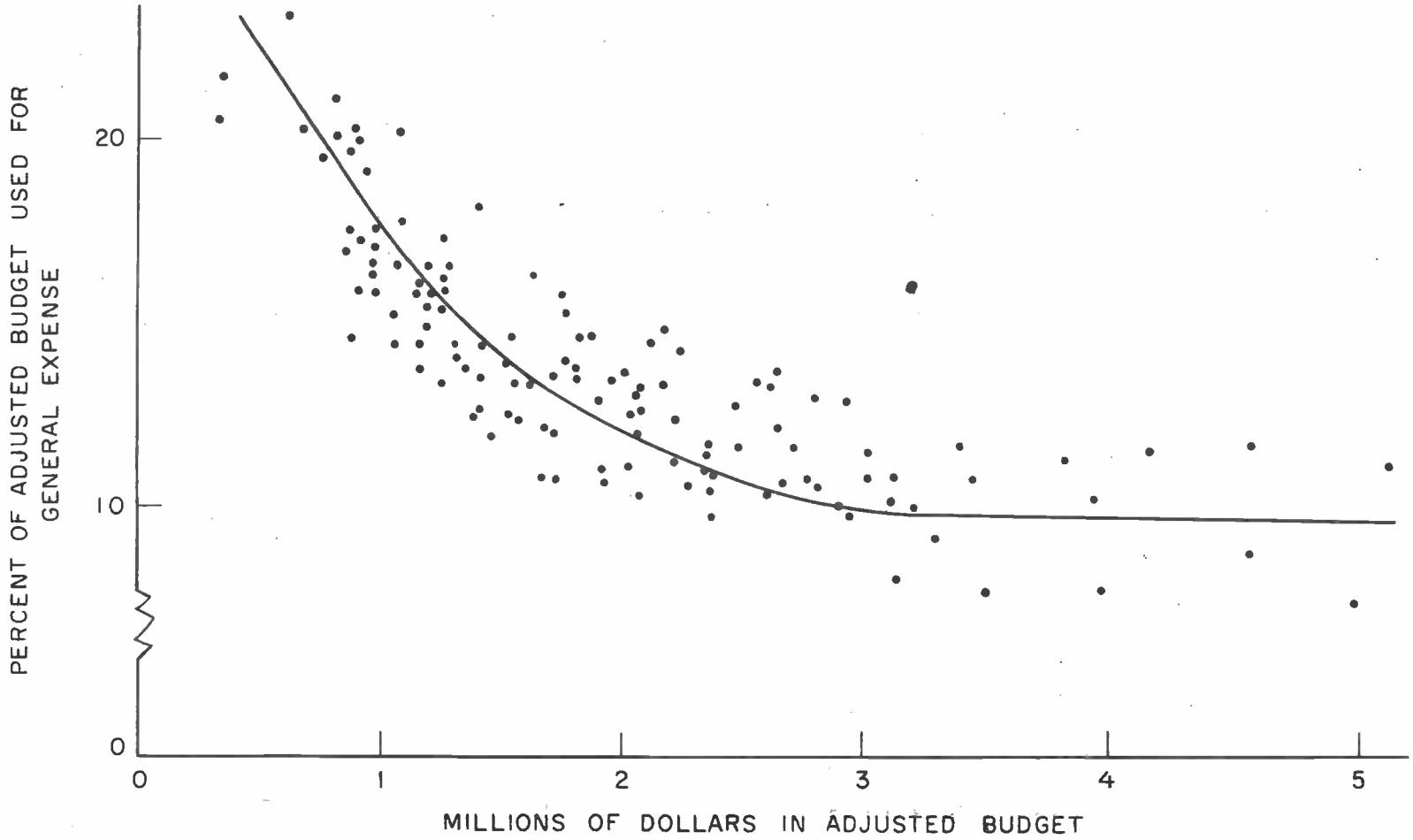
a. Forest Size Factors. To get a usable factor for size, the Regional team used the following formula:

$$1969 \text{ S. O. Workload factor} = \frac{\text{S.O. workload (in M hours}}{24M}$$

This formula provides factors in the range of 0.46 to 1.07 - an easy range to work with - as follows:

FIGURE 4

TOTAL ADJUSTED BUDGET COMPARED WITH PERCENTAGE USED FOR GENERAL EXPENSE ON ONE HUNDRED AND TWENTY SEVEN NATIONAL FORESTS



Forest Size Factors (1969 Workload)

Forest	Size Factor	Forest	Size Factor
1	1.07	7	0.64
2	0.93	8	0.59
3	0.78	9	0.53
4	0.75	10	0.52
5	0.72	11	0.46
6	0.64	12	0.45

The divisor of 24 M is in the upper range of the 1969 measured S.O. workloads in the sample Region.

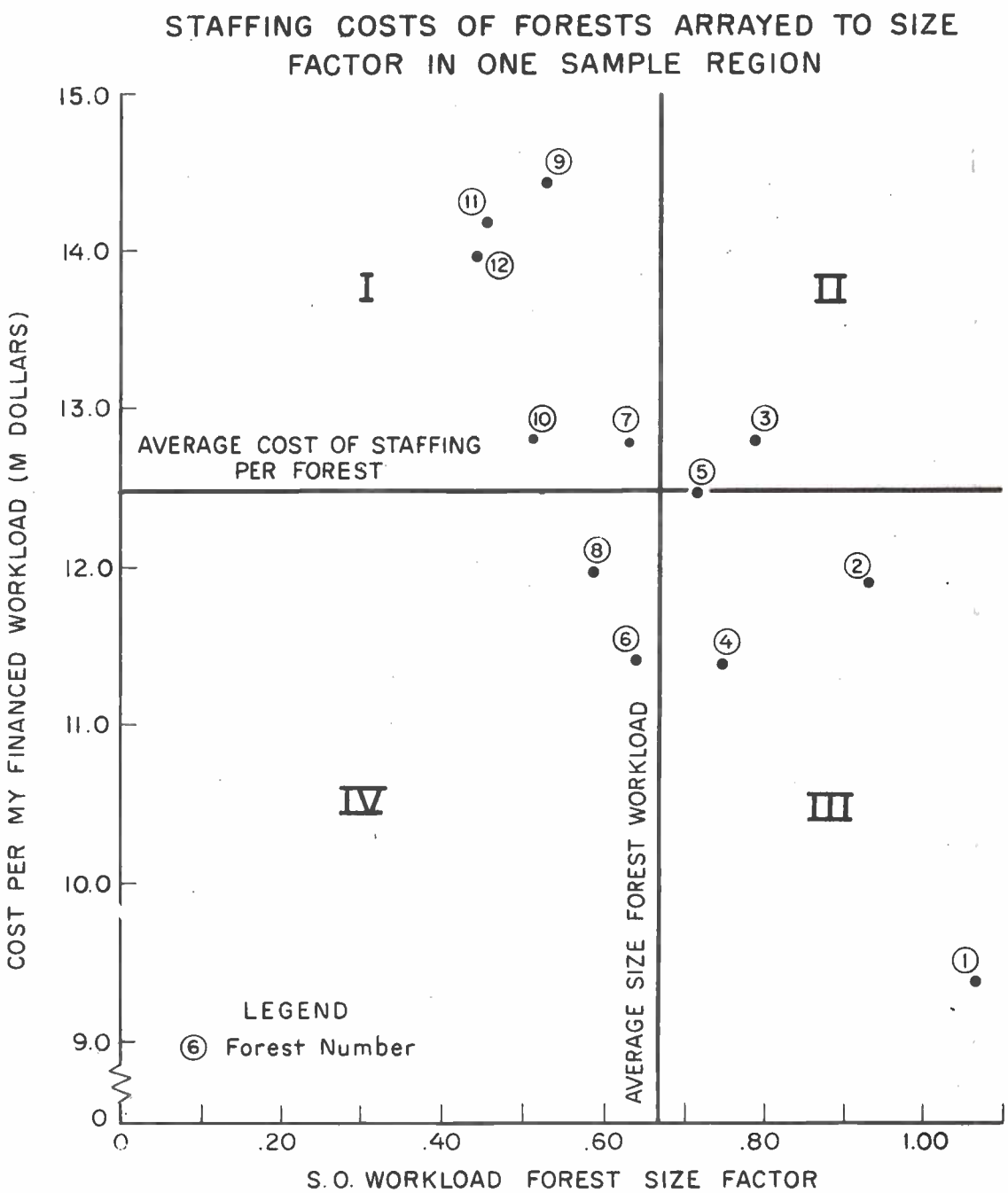
b. Staffing Costs. One major cost which is influenced by a Forest's size is the base Supervisor and staff salary costs. These costs include all Supervisor and base staff as shown on 6500-10's and 1300-10's.

To get a usable cost factor, the Regional team divided the total 1969 staffing cost for each Forest in the sample Region by the total financed man-years of S.O. Workload plus project management (1300-10) for each Forest. The average cost to staff a man-year was determined to range between $9,400 and $14,400.

The following table shows the relationship of the Forest size factors and average staffing costs per man-year, as determined above.

Forest	Size Factor	Average Cost per Financed Man-Year of Staffing
1	1.07	$ 9,400
2	0.93	11,900
3	0.78	12,800
4	0.75	11,400
5	0.72	12,500
6	0.64	11,400
7	0.64	12,800
8	0.59	12,000
9	0.53	14,400
10	0.52	12,800
11	0.46	14,200
12	0.45	13,000

CHART 3



There is an indication of economies of scale in the cost of staffing as the Forests become larger. Five of the seven Forests with costs at average or above are below average in size - 71%. Three of the five Forests with cost at average or below are above average in size - 60%.

Chart 3 graphically illustrates the relationship between Forest size and staffing costs. Using the quadrant method again, we see:

(1) Quadrants I and IV together indicate that seven Forests are below the Regional average in size, and five (71%) of these Forests have staffing cost at or above the average Forest in the sample Region.

(2) Quadrants II and III together indicate five Forests above average in size, and three of these (60%) have average or below staffing costs. Further comparisons are listed on the bottom of Chart 3.

The cost of Supervisor and staff salaries are compared above to the size of Forests in the sample Region to the size of Forests as indicated by S.O. workloads. The Business Management cost group can also be compared to size factors in a similar manner.

For comparison purposes, man-years of BM staffing per million dollars of Forest expenditures can be used. These figures are F.Y. 1968 less contracts, Water Resource Development funds, and expanded range program.

Business Management Man-Years
per MM$ Adjusted Allotments
(1969 S.O. Workload)

Forest	Size Factor	Man-Years/MM$
1	1.07	9.7
2	0.93	10.2
3	0.78	11.8
4	0.75	9.7
5	0.72	12.2
6	0.64	11.6
7	0.64	11.7
8	0.59	12.7
9	0.53	11.3
10	0.52	13.9
11	0.46	12.4
12	0.45	12.2
Average	0.67	11.6

There is an indication of economies of scale in the amount of BM staffing needed as the Forests become larger. Three of the five

Forests staffed in BM at or below average are above average in size - 60%.

Five of the seven Forests above average in BM are below average in size - 71%.

In the following section, several types of size factors are used to bring out further indicators of efficiency.

D. Indicators of Both Effectiveness and Efficiency Compared With Size of Forest and District in One Sample Region.

1. Using 1969 S.O. workload as indicator of size, the preceding charts numbered 1, 2, and 3 illustrate individual methods for relating:

a. Forest effectiveness ratings to Size-of-Forest.

b. Forest effectiveness ratings to average (composite) District size.

c. Man-years of Forest staffing costs to Size-of-Forest.

Since the above charts indicate an apparent positive relationship between Forest and/or District size and both effectiveness (ratings) and efficiency (staffing costs) indicators, it appears desirable to graphically relate all of these together at the same time as shown in Chart 4.

Chart 4 has been divided into four quadrants, so that the two size criteria can be related to indicators of effectiveness and efficiency, collectively or separately.

Quadrant 1 - Forests which fall in this quadrant are above average in total size and below average in composite District size. The sample Region has none.

Quadrant II - Forests which fall in this quadrant are above average in total size and above average in composite District size. The sample Region has 5.

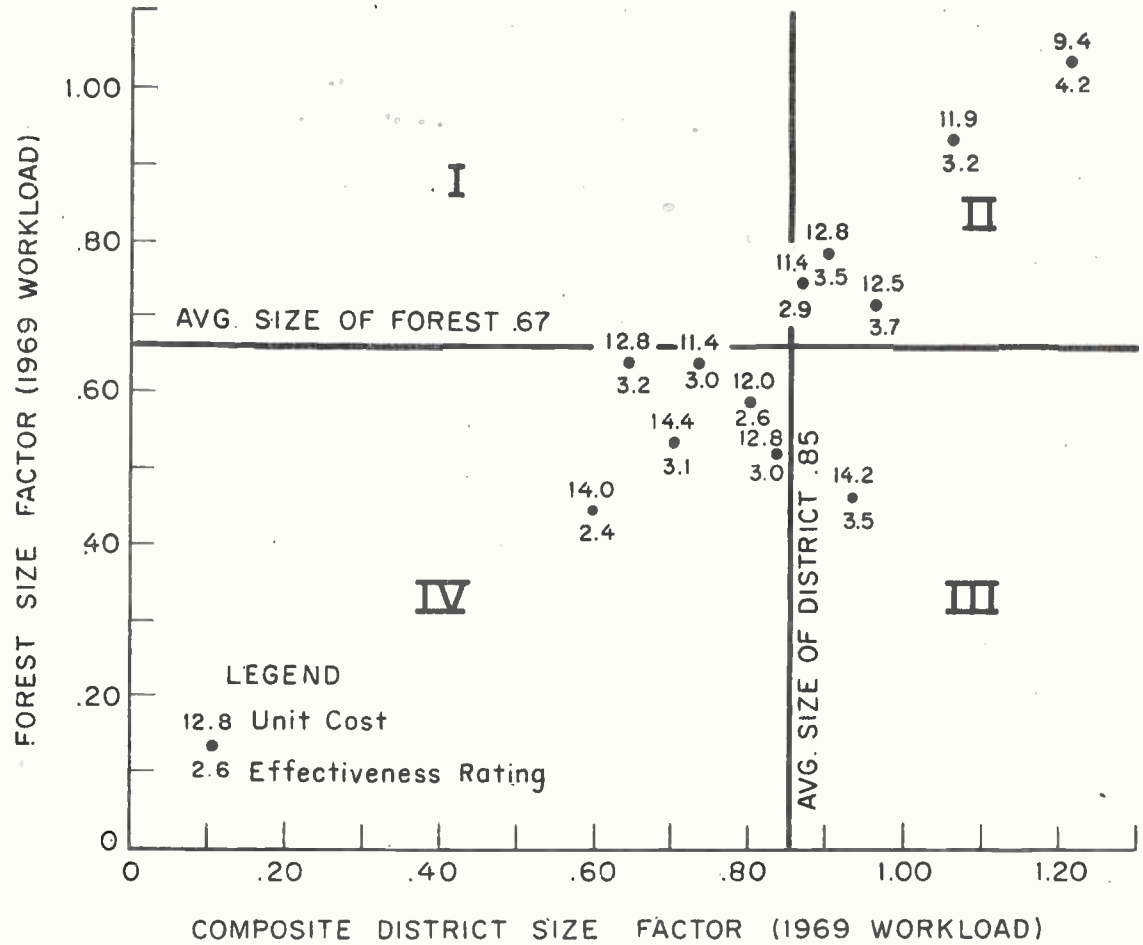
		Regional Average
Average Staffing Cost per MY Financed Workload	$11,600	$12,500
Average Effectiveness Rating	3.5	3.2

Quadrant II denotes high efficiency, high effectiveness.

CHART 4

CORRELATION OF OVERALL FOREST AND/OR DISTRICT SIZE (1969 WORKLOADS) WITH EFFECTIVENESS (RATINGS) AND EFFICIENCY (STAFFING COSTS) INDICATORS.

FOREST SIZE ARRAYED TO COMPOSITE DISTRICT SIZE IN ONE SAMPLE REGION



Note:
Each point represents a Forest. The figure above the point is the average cost of a man-year staffing according to the financed S.O. Workload in M dollars. The lower figure is the effectiveness rating for that Forest on a scale of 1 thru 5.

Quadrant III - Forests which fall in this quadrant are below average in total size and above average in composite District size. The sample Region has 1.

		Regional Average
Staffing Cost per MY Financed Workload	$14,500	$12,500
Effectiveness Rating	3.5	3.2

Quadrant III denotes low efficiency, high effectiveness

Quadrant IV - Forests which fall in this quadrant are below average in total size and below average in composite District size. The sample Region has 6.

		Regional Average
Average Staffing Cost per MY Financed Workload	$12,900	$12,500
Average Effectiveness Rating	2.9	3.2

Quadrant IV denotes low efficiency, low effectiveness.

The majority of the most effective Forests are in Quadrants II and III.

The most efficient Forests appear to be in Quadrants I (assumed) and II.

Ideally, more Forests should fall into Quadrant II and less in Quadrant IV. Those Forests in Quadrant IV could become more efficient if their total size were raised but probably not more effective unless the composite District size were raised also.

2. Using "Other" Measures as Indicators of Size. Since the 1969 workload as an indicator of size resulted in the apparent positive relationships shown in Chart 4, the Regional team examined "other" size measures for similar relationships in the same manner. The calculations for examining these "other" size measures are shown in detail in the Appendices - Exhibit 9.

A summary of all the various Forest size measures that are listed in the Appendices and how they relate to indicators of effectiveness and efficiency for the sample Region follows:

Summary Showing How Various Methods of Measuring Forest Size Relate to Indications of Efficiency and Effectiveness

Size Related to Efficiency

Measure of Forest Size	Relation of Different Sized Forests and/or Districts to Indicators of Efficiency and Effectiveness			
	L. Forest S. Dist.	L. Forest L. Dist.	S. Forest L. Dist.	S. Forest S. Dist.
1969 Base SO Workload	-	M^2	L^2	L^1
1965 Base SO Workload + CCC	M^2	M^1	L^2	L^1
Total Forest Adj. Budget	L^1	M^1	L^2	L^1
Total RD Base Workload	L^1	M^1	-	L^2
Total RD Budget	M^1	M^2	L^1	L^1
Total Net Forest Acres	M^1	L^1	M^2	L^2

Size Related to Effectiveness

1969 SO Workload	-	M^1	M^1	L^2
1965 SO Workload + CCC	L^2	M^1	M^2	L^1
Forest Adj. Budget	M^1	M^1	M^1	L^2
Total RD Workload	M^2	M^2	M^2	L^2
Total RD Budget	M^2	M^1	M^2	L^2
Total Net Forest Acres	M^1	M^2	L^2	L^1

Key: M^1 = Most efficient or effective
M^2 = More efficient or effective
L^1 = Less efficient or effective
L^2 = Least efficient or effective.

If Forest acres are excluded from these tables, it is evident that the larger Forests are the most efficient in terms of staff costs and the larger District units are the most effective.

We can say that in the sample Region this definitely is the case. If this type of approach was applied nationally, logic dictates the same may be true.

In general, Forest effectiveness in the sample Region appears to be determined by the interacting relationships of Forest size to District size in the descending scale of:

a. Large Forests with Large Districts - most effective
b. Small Forests with Large Districts - more effective
c. Large Forests with Small Districts - less effective
d. Small Forests with Small Districts - least effective

While the above scale appears to hold up generally, it must be pointed out that there will undoubtedly be exceptions to the rule

because of other unknown or unmeasurable factors. In addition, it appears important to point out that small Forests with large Districts can be highly effective - therefore, the effectiveness of large Forests with small Districts and small Forests with small Districts can probably be materially increased by the creation of larger Districts without making excessive changes in Forest boundaries or consolidating Forests.

From a practical standpoint, the effectiveness of a Forest in the sample Region appears to be the sum or cumulative effectiveness of its Districts, and large Districts generally appear to be the most effective.

In general, indicators of Forest efficiency in the sample Region appear to be reflections of the economies of scale inherent in larger size administrative units in the descending scale of:

a. Large Forests - Large Districts - most efficient
b. Large Forests - Small Districts - more efficient
c. Small Forests - Large Districts - less efficient
d. Small Forests - Small Districts - least efficient

In reality, the above scale is merely another method of showing that a small Forest with small Districts will usually have proportionately higher overhead costs in Forest staffing and business management staffing costs than larger Forests with the same number (or less) Ranger Districts. (i.e., small subunits require proportionately higher overhead costs).

A small Forest also requires a minimum number of Forest staff and BM staff to do business. As units become larger, economies of scale become apparent in overhead costs.

E. Costs of Change. The estimated range in one-time costs of eliminating a Forest Supervisor's office is from approximately $62,000 to $270,000. The Appendices - Exhibit 10 - contain the details of how this range was determined from the simulated elimination of four sample Forest Supervisors' offices in two Regions.

F. Savings Opportunities. Two methods and one model were used to determine an estimated range of $54,000 to $139,000 of annual savings upon the elimination of a Forest Supervisor's office. The Appendices - Exhibit 11 - contain the details of how this range was determined.

G. Cost-Savings Relationships

The estimated range of one-time closing costs is from $62,000 to $270,000. The estimated range of annual savings is from $54,000 to $139,000. Assuming a proposed consolidation of two Forests with maximum one-time closing costs ($270,000) and minimum annual savings ($54,000), even maximum closing costs could be fully amortized in approximately five years. Since the most practical and feasible Forest consolidations would probably involve two small Forests or a medium sized and a small Forest - it is more likely that one-time closing costs would be amortized in a one- to two-year period in most instances.

VII. SUMMARY

A. Discussion

Since the W.O. and Regional teams conducted rather independent research on Forest effectiveness, all efforts must be evaluated to determine what degree of correlation, if any, may exist.

B. Correlation of Separate Concepts

1. Measuring the Size-of-Forests. On a trial and error basis, either the W.O. or a Regional team expressed National-Forest-Size by each of the following:

a. Adjusted Forest budget
b. Supervisor's Office base workload (1969)
c. Supervisor's Office base workload + CCC (1965)
d. Number of Ranger Districts and/or equivalent organizational units
e. Net National Forest acreage
f. Gross National Forest acreage
g. Total District budgets
h. Total District workloads

All of the measures except net and gross National Forest acres appear to express Forest size in a useful form. However, any of the measures based on workload appear to lose some value for current annual use as the time period since the last recurrent measurement of the base increases.

Consequently, adjusted Forest budget (which also reflects base workload and development work) appears to be the most useful and practical for currently expressing National Forest size. It is practical since it can be readily and currently updated to any given year by application of known "increased cost of doing business factors" to an established base year (F.Y. 1968).

2. Effectiveness as Related to Adjusted Budget Size, and Effectiveness as Related to Size-of-District. Analysis by the Washington Office and Regional teams suggests that effectiveness tends to be greater in larger budgeted organizational units. There are some inconsistencies in effectiveness relationships that suggest that size is not correlated as strongly with effectiveness when second level units have substantial physical separations from other second level units, such as in the eastern Regions.

Also, the results of initial attempts by the Washington Office to relate average District size to Forest effectiveness ratings using average District workload to express Forest size were not meaningful when applied Service-wide. However, Regional observations suggested that Forest effectiveness is significantly related to District size, particularly in Region 3, and possibly the same relationship exists Service-wide. Consequently, a regression analysis was first run for all Regions relating Forest effectiveness ratings to average District size for each Forest. District size was expressed by the Size-of-District formula. (See linear regression charts in Appendices - Exhibit 7.)

This analysis suggests that Forests with larger average size of Districts (from Size-of-District formula) tend to be more effective in all Regions except 2, 4, and 5. This tendency, however, is not statistically significant.

Intuitively, it is impossible to fathom why large average District size tends toward increasing Forest effectiveness in all Regions except 2, 4, and 5 unless some unknown but dominating factor or factors are at work in these Regions. However, since the Size-of-District formula for measuring District size is strongly influenced by several factors, including acreage, there may be other ways to look at District size.

The Size-of-District Study indicates that Districts with four or more principal staff employees tend to be more effective than Districts with fewer employees. Consequently the number of principal staff employees per District per Forest related to Forest effectiveness ratings may be a more significant way of relating size to effectiveness.

A second regression analysis relating the average number of principal employees per District per Forest to Forest effectiveness ratings also shows a tendency for Forests with larger Districts (staffing) to be more effective in all Regions except 4, 8, and 9. (See Appendices- Exhibit 8.) This tendency

also is not statistically significant. There is, however, nothing to indicate a negative relationship between increased District substaffing and Forest effectiveness.

3. Efficiency as Related to Size. Using overhead costs as indicators of efficiency, both the Washington Office and Regional teams identified definite economies of scale related to larger size Forests. There are, however, indications that these "economies of scale" tend to reach a point of diminishing returns when a Forest's adjusted budget approaches or exceeds 3 million dollars (F.Y. 1968 base year).

4. Span of Control as Related to Indicators of Effectiveness and Efficiency of a Forest. There are National Forests that currently have from 3 to 14 third level units (Ranger District or equivalent). From the information gathered by the Washington Office and Regions there is no indication that within the above range the number of subunits, as such, has any significant relationship--either positively or negatively--with Forest effectiveness. The composite size of the subunits does appear to influence effectiveness.

The number of third level units apparently does have an effect on efficiency because fewer but larger subunits require less overhead costs and "economies of scale" can be captured. Smaller and more numerous subunits require proportionately more overhead and "economies of scale" cannot be captured.

5. Costs Compared to Savings. Information collected on three Region 1 sample Forests and analyzed at the Washington Office indicates the one-time cost of eliminating a Forest headquarters could range between a maximum of about $270,000 to a minimum of about $62,000. Annual savings, however, could range from a maximum of about $109,000 to a minimum of about $54,000.

A sample consolidation test model made in Region 3 indicates one-time costs of about $76,000 and annual savings of about $139,000.

The methods used to estimate consolidation costs and potential savings by the Washington Office and Regional teams are not directly comparable on an item by item basis. However, all methods are logical and rational and cover approximately the same potential cost and/or savings categories.

Consequently, it appears that potential annual savings would recover the majority of Forest consolidation costs in about a one- to two-year period. Over a ten-year period, savings would generally be quite significant. However, each potential consolidation would have to stand on its own merits.

VIII. CONCLUSIONS

A. The Forest effectiveness ratings collected for each Region except 10 have an acceptable validity as a measure of effectiveness.

B. In general, there is a positive correlation between effectiveness of a National Forest and size as represented by its adjusted budget.

C. The "Size-of-District Study" suggests that Districts with at least four principal staff employees are more effective than those with less than four.

A further analysis of the relationships of District size (expressed in either workload or staffing) to Forest effectiveness ratings shows that there is a tendency for existing Forests with larger average sized Districts to be more effective than smaller Forests with smaller average sized Districts. The tendency, however, is not statistically significant Service-wide.

D. There are no indicators that small size (either District or Forest) contributes to greater effectiveness. Small size can be a handicap to a National Forest in its operations. Large size gives a Forest a better chance to operate effectively but it is not a guarantee of effective performance.

E. There are no indicators, within the current range of 3 to 14 subunits, that span of control has any significant influence on Forest effectiveness. Therefore, a small Forest with large Districts may be highly effective but not efficient, and the relative size and not number of subunits is a primary factor influencing Forest effectiveness.

F. No indicators that, in general, large Forests with large Districts and small Forests with large Districts are not more effective than large Forests with small Districts, and small Forests with small Districts.

G. An analysis of costs of staffing and the percent of Forest budgets expended in overhead costs indicates there are generally:

1. Positive and identifiable "economies of scale" inherent in larger organizational units (Forests).

2. Maximum "economies of scale" in large organizational units with large subunits (large Forest-large Districts).

3. Moderate "economies of scale" in large organizational units with many small subunits, and small organizational units with few but larger subunits (large Forest-small Districts and small Forest-large Districts).

4. Minimum "economies of scale" or proportionately highest overhead costs in small organizational units with small subunits (small Forests-small Districts).

H. An analysis of the several relationships between Forest size factors and effectiveness and the percent of budget expended in overhead costs suggests that:

1. A minimum of at least four principal staff employees is usually required on a Ranger District to create the necessary base for effective District performance.

2. The Ranger District is the building block for creating Forests. Larger Districts tend to be more effective, and are thus the primary building block for creating effective Forests.

3. A Forest's effectiveness tends to be the cumulative effectiveness of its Ranger Districts.

4. Theoretically, a National Forest would currently approach optimum effectiveness and efficiency with an adjusted budget (1968 base) of approximately 3 million dollars and Ranger Districts that are each financially capable of supporting four or more principal staff employees.

I. An analysis of the total information collected on potential one-time costs of consolidation, and cumulative potential annual savings indicates:

1. The one-time costs of any consolidation of two Forests will usually be amortized by annual savings in a one- to two-year period.

2. After the amortization of the one-time costs of consolidation, significant annual savings could be made available at the Forest level to increase staffing at the District level and thus tend to increase both Forest and District effectiveness.

J. In general, it is not easy to directly relate the result of this study to the study of Ranger Districts. It would be convenient if we could say that in all cases and in all Regions certain minimum size workload Districts or Districts with a minimum number of principal staff employees result in effective Districts, and effective Districts result in effective Forests. However, the methodology of the Ranger District Study does not permit comparisons of Districts on different Forests, let alone comparing Districts between different Regions. There are tremendous differences between Regions.

It appears that there are some advantages associated with larger sized Districts, but just how advantageous depends on what size range of Districts presently exists within a given Region.

For example, we know from the Size-of-District Study that Districts with four or more principal staff employees tend to be more effective than those with less than four.

Since average District principal staffing in Regions 2, 3, 4, and 8 is about 2.72, 3.00, 2.38 and 3.21 employees per District, respectively, any action of either consolidation of Districts or direct increase in staffing to obtain a minimum of four principal staff on each District will probably increase effectiveness and possibly reduce the overhead costs of a given Forest.

However, the average District principal staffing in Regions 1, 5, 6, and 9 is about 3.99, 5.27, 5.16, and 3.76 employees per District, respectively. District consolidations that take two or more small Districts and create Districts with a minimum staff of four or more professionals will also probably tend to significantly increase effectiveness and reduce overhead costs in these Regions. District consolidations that might combine Districts where four or more professionals are now employed on each District will tend to increase effectiveness but to a lesser degree, and savings in overhead costs would continue to be significant.

Thus, we see that the opportunity to increase Forest effectiveness through District consolidations appears to be considerably greater in Regions 2, 3, 4, and 8 and less in Regions 1, 5, 6, and 9. Also, there are probably more opportunities for reducing Forest overhead costs in Regions 2, 3, 4, and 8.

So it appears that there are some advantages associated with larger size Districts and probably even more significant advantages associated with larger sized National Forests. Each should be considered, but they should be considered independently within each specific Region. Presumably, the highest degree of effectiveness is reached by avoiding both small subunits and small second level units. Although not identified in this study, there may be negative effects associated with organizations larger than the largest encountered. Therefore, it would be prudent to avoid large scale reorganization that increases organizational size much beyond the point where most of the size related benefits in efficiency and effectiveness have been captured.

APPENDICES

CONTENTS FOR APPENDICES

EXHIBIT 1

MANAGEMENT FRAMEWORK FOR MEASURING EFFECTIVENESS

One Regional team attempted to design an effectiveness rating system for sample Forests from the "Management Framework" described on page 12 of the report.

To develop this framework, the team separated a Forest's management tasks into four basic and identifiable categories. They are:

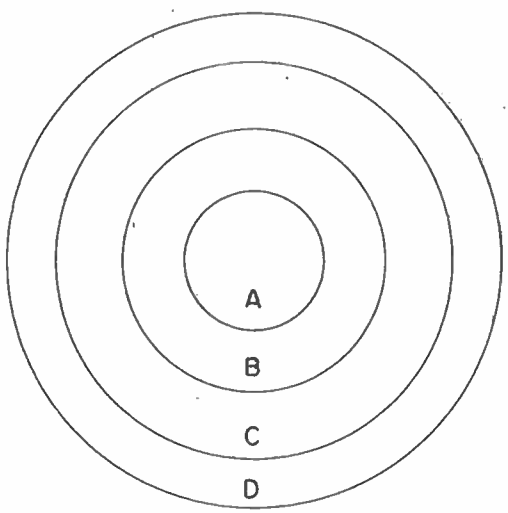
1. Management and administration of the workload generated by internal needs.

2. Management and administration of the workload generated by direct Forest users (contractual relationship).

3. Management and administration of the workload generated by indirect Forest users (non-contractual relationship).

4. Management and administration of the workload generated by socio-economic and political impacts.

The above framework can be visualized as follows:



A through D = Forest Supervisor and primary staff areas of responsibility

A = Internal tasks

B = Direct Forest user oriented tasks

C = Indirect Forest user oriented tasks

D = External socio-economic and politically oriented tasks

To apply the "management framework" and try to get at some additional indicators of effectiveness, the Regional study team gave each Forest Supervisor and staffman (financed wholly or partly from the base) a complete list of the 1965 job descriptions contained in the "Analysis of Recurrent Workload-Supervisor and Staff" (a total of 215 items). Action was taken as follows:

1. Each Forest Supervisor and primary staffman:

   a. Went through the job description list and checked all jobs on which they worked in F.Y. 1968. They also added any project managerial jobs upon which they worked.

   b. Estimated the hours and percent of their total time spent on each task.

2. Each Forest Supervisor and staffman also provided the study team with:

   a. Number of trips to Ranger Districts.

   b. Mileage and per diem expenses involved in servicing the Districts.

3. By interview of two to three District Rangers and each Forest Supervisor and staffman, the study team members attempted to obtain a subjective evaluation of just how the staff time was spent on each sample Forest.

The team then constructed a table that assigned all of the tasks listed by each Supervisor and his staff for F.Y. 1968 to the four areas of management listed above. A comparative time analysis was made of just how and where each Forest Supervisor and his staffmen spent their time.

The time analysis did not provide any new insights into the possible development of alternative ways to measure effectiveness. Yet, the analysis was useful to the team members to gain more knowledge as to just how each Forest operated. In addition, we noted the following:

1. In general, the larger functional activities had proportionately fewer hours spent on them per unit of financed workload than did the smaller functions.

2. In general, the majority of the functions on the larger workload Forests had proportionately fewer hours spent on them per unit of workload than was spent on the same functions on smaller Forests.

3. The three study Forests averaged 7.8 man-years financed workload. Forest A is larger than the Regional average; Forests B and C are smaller than average.

4. The average functional financed workload for the three Forests is 0.6 man-years. There are functions larger and smaller than average on each of the three Forests.

The same sample Forests were also selected by the UCLA study team for evaluation in its study "Organizational Phenomena in the Forest Service." The UCLA study and the Regional time study may eventually provide further data that can be used as indicators of effectiveness on Forests.

EXHIBIT 2

EFFECTIVENESS COMPARISON

Ranking of Forest Effectiveness from a cumulative point system in R-1 compared to ranking from a Service-wide questionnaire.

Forest	Effectiveness Ranking	
	Questionnaire	Point system
1	15	13
2	10	9
3	12	11
4	7	6
5	9	9
6	6	12
7	4	3
8	1	2
9	16	14
10	14	15
11	5	1
12	1	4
13	13	16
14	3	4
15	8	7
16	11	8

(Note - consistency between methods is comparatively uniform except for Forests 6 and 11)

Ranking of Forest Effectiveness from a composite of R-3 top management opinions compared to ranking from Service-wide questionnaire.

Forest	Effectiveness Ranking	
	Questionnaire	Point system
1	1	2
2	2	5
3	3.5	3
4	3.5	9
5	5	1
6	6	8
7	7	10
8	8	11
9	9	7
10	10	6
11	11	4
12	12	12

(Note - again, the consistency between methods is comparatively uniform except for Forests 4 and 11)

EXHIBIT 3

FOREST A

SUPERVISOR BASE AND PROJECT MANAGEMENT WORKLOAD - F.Y.1970

BASE	I&E	RANGE	RECRE-ATION	TIMBER	WATER-SHED	WILD-LIFE	LAND USE	MIN-ERAL	FIRE CONT.	I&DC	LAND ADJ.	ENG.	GEN. ADM.	BD KV CWFS	TOTAL	M.Y.
1. Gross Base	1,177	2.434	841	3,239	962	707	678	1,447	1.163	125	264	3.981	3.131	-	20.149	11.2
2. % Financed-F.Y. 1970	77	48	95	95	68	53	40	40	95	85	80	77	77	-	-	-
3. Financed Workload	906	1.168	799	3,077	654	375	271	579	1,105	106	211	3,065	2,411	-	14.727	8.2
PROJECT MANAGEMENT														447 466		
4. Form R6-1300-10	-	1,227	214	240	625	46	-	-	-	1	320	-		126	3,712	2.0
5 Total Workload (3 plus 4)	906	2,395	1,013	3.317	1,279	421	271	579	1,105	107	531	3.065	2,411	1.039	18,439	10.2
ACTUAL BASE AND PROJECT MGMT. INDIVIDUAL STAFFING (Per 1300-3)																
Forest Supervisor	105	179	62	238	71	52	49	52	86	9	64	104	633	96	1,800	1.0
R&L	80	-	480	-	-	-	480	120	-	-	480	-	160	-	1,800	1.0
WM&WL	-	-	-	-	876	644	-	-	-	-	-	-	280	-	1,800	1.0
FC	328	-	-	-	-	-	-	-	888	-	-	-	584	-	1,800	1.0
TM	-	-	-	1,239	-	-	-	-	-	94	-	-	287	180	1,800	1.0
RM	-	1,520	-	-	-	-	-	-	-	-	-	-	280	-	1,800	1.0
ENG.	16	40	56	40	64	8	40	16	24	-	16	1,256	224	-	1.800	1.0
6. Total Base and P.M. Staffing	529	1.739	598	1,517	1.011	704	569	188	998	103	560	1.360	2,448	276	12,600	7.0
Difference 6 minus 5	-377	-656	- 415	-1,800	- 268	+ 283	+ 298	-391	- 107	- 4	+ 29	- 1.705	+ 37	-763	- 5.839	- 3.2

EXHIBIT 4

FOREST B

SUPERVISOR BASE AND PROJECT MANAGEMENT WORKLOAD - F.Y. 1970

BASE	I&E	RANGE	RECREATION	TIMBER	WATERSHED	WILDLIFE	LAND USE	MINERAL	FIRE CONTROL	I&DC	LAND ADJ.	ENG.	GEN. ADMN.	BD KY CUTS	TOTAL	M.Y
1. Gross Base	864	3,053	521	2,034	261	645	359	234	1,084	108	238	2,966	2,275	-	14,642	8.1
2. % Financed -F.Y. 1970	77	48	95	95	68	53	40	40	95	85	80	77	77	-	-	-
3. Financed Workload	665	1,465	495	1,932	177	342	144	94	1,030	92	190	2.284	1.752	-	10,662	5.9
PROJECT MANAGEMENT														2 1		
4. Form R6-1300-10	-	430	156	30	403	47	-	-	-	18	330	-	-	13	1,430	.8
5. Total Workload (3 plus 4)	665	1.895	651	1,962	580	389	144	94	1,030	110	520	2,284	1,752	16	12.092	6.7
ACTUAL BASE & PROJECT INDIVIDUAL STAFFING (Per 1300-3)																
Forest Supervisor	60	262	179	120	68	114	28	-	50	-	24	104	783	8	1,800	1.0
[illegible]	100	26	32	888	4	6	-	-	70	72	-	20	462	120	1,800	1.0
[illegible]	10	868	48	20	18	280	4		18	-	-	26	508	-	1,800	1.0
[illegible]	50	26	584	12	6	14	214	88	18	-	168	80	540	-	1.800	1.0
Engineering	26	64	176	48	28	6	-	-	34	-	8	784	986	-	2,160	1.2
FC	34	26	44	20	4	6	-	-	933	-	-	94	635	4	1,800	1.0
[illegible] - Project	-	-	-	-	452	-	-	-	-	-	-	-	-	-	452	.3
6. Total Base and PM Staffing	280	1,272	1,063	1,108	580	426	246	88	1,123	72	200	1,108	3,914	132	11,612	6.5
Difference 6 minus 5	-385	-623	+412	-854	-	+37	+102	-6	+93	-38	-320	-1,176	+2,162	+116	-480	-.2

EXHIBIT 5

FOREST C

SUPERVISOR BASE AND PROJECT MANAGEMENT WORKLOAD - F.Y. 1970

BASE	RANGE	RECREATION	TIMBER	WATERSHED	WILDLIFE	LAND USE	MINERAL	FIRE CONTROL	I&E	LAND ADJ.	ENG.	GEN. ADM.	BD KV CWPS	TOTAL	M.Y.
1. Gross Base	761	1,111	401	2,739	91	344	274	312	828	59	184	2,788	1,820	-	11,712	6.5
2. % Financed - F.Y. 1970	77	48	95	95	68	53	40	40	95	85	80	77	77	-	-	-
3. Financed Workload	586	534	381	2,602	62	182	110	125	787	50	148	2,147	1,401	-	9,115	5.1
PROJECT MANAGEMENT														251 350		
4. Form R6-1300-10	-	453	166	300	155	60	-	-	-	70	600	-	-	75	2,480	1.4
5. Total Workload (3 plus 4)	586	987	547	2,902	217	242	110	125	787	120	748	2,147	1,401	676	11,595	6.5
ACTUAL BASE AND PROJECT MGMT. INDIVIDUAL STAFFING (Per 1300-3)																
Forest Supervisor	144	138	138	224	36	60	68	14	108	16	112	200	542	-	1,800	1.0
FC	64	-	-	-	-	-	136	52	696	-	516	76	136	124	1,800	1.0
R&L	280	-	888	-	-	-	260	-	-	-	-	100	272	-	1,800	1.0
RM	48	848	-	-	235	275	-	-	-	-	-	-	394	-	1,800	1.0
Engineering	40	-	224	16	-	-	80	-	-		24	1,272	144	-	1,800	1.0
TM	28	-	-	2,810	-	-	-	-	-	126	-	-	256	380	3,600	2.0
GA	-	-	-	-	-	-	-	-	-	-	-	-	180	-	180	.1
Total Base & P.M. Staffing	604	986	1,250	3,050	271	335	544	66	804	142	652	1,648	1,924	504	12,780	7.1
Difference 6 minus 5	+18	-1	+703	+148	+54	+93	+434	+59	+17	+22	-96	-499	+523	-172	+1,185	+.6

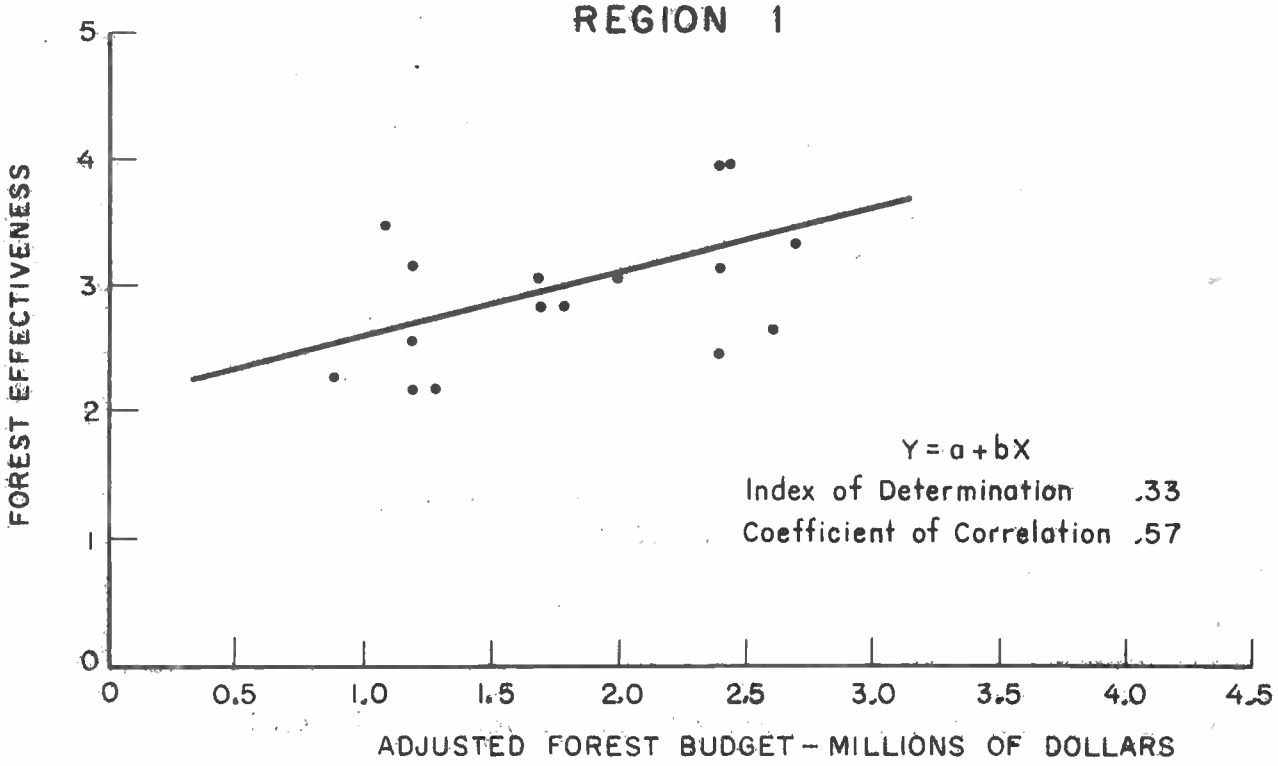
EXHIBIT 6

Forest Effectiveness Ratings Arrayed With Adjusted

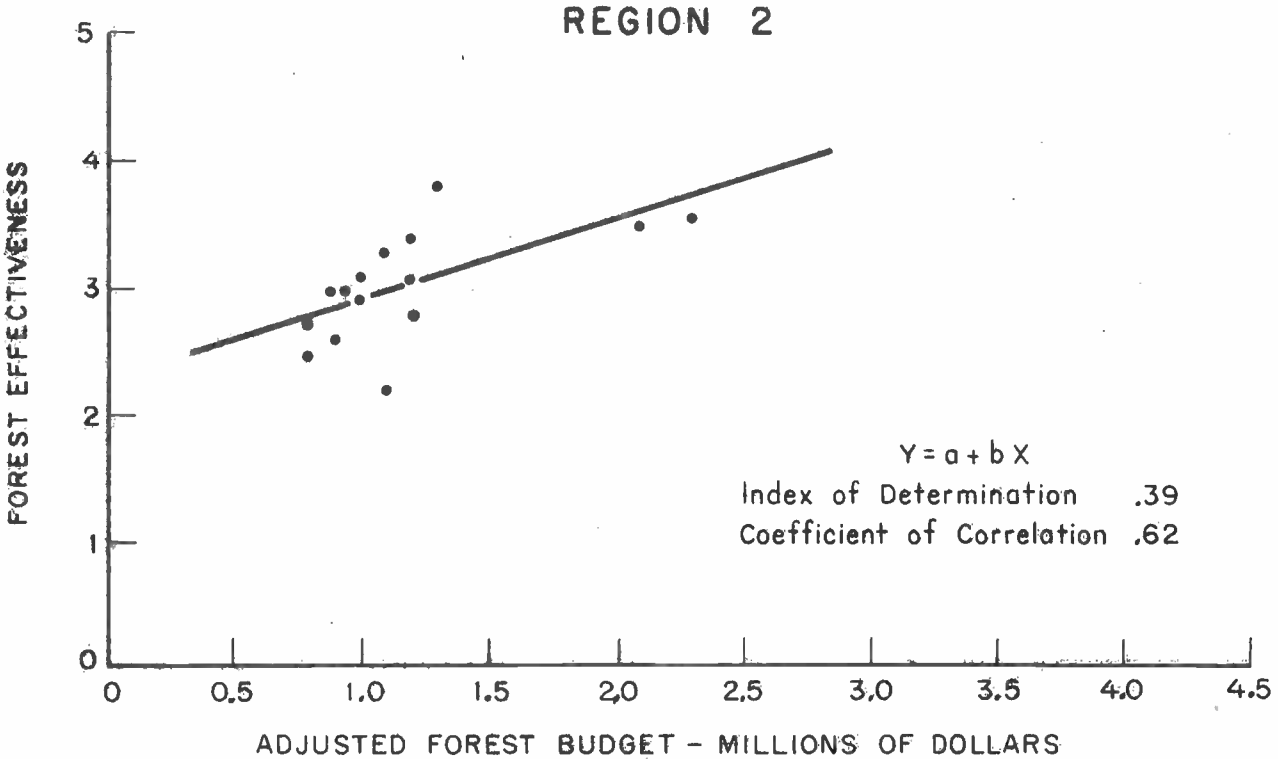
Forest Budget by Regions

EFFECTIVENESS AS DETERMINED BY FOREST BUDGET

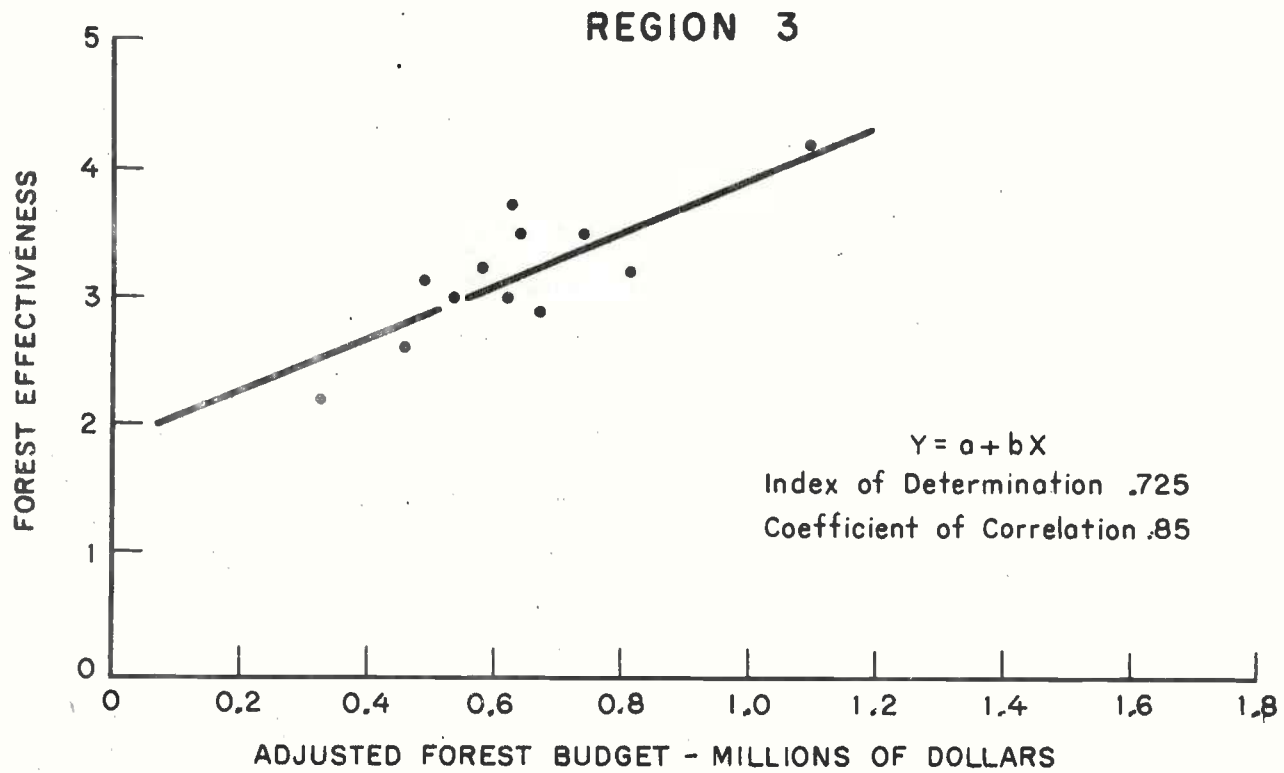
REGION 1

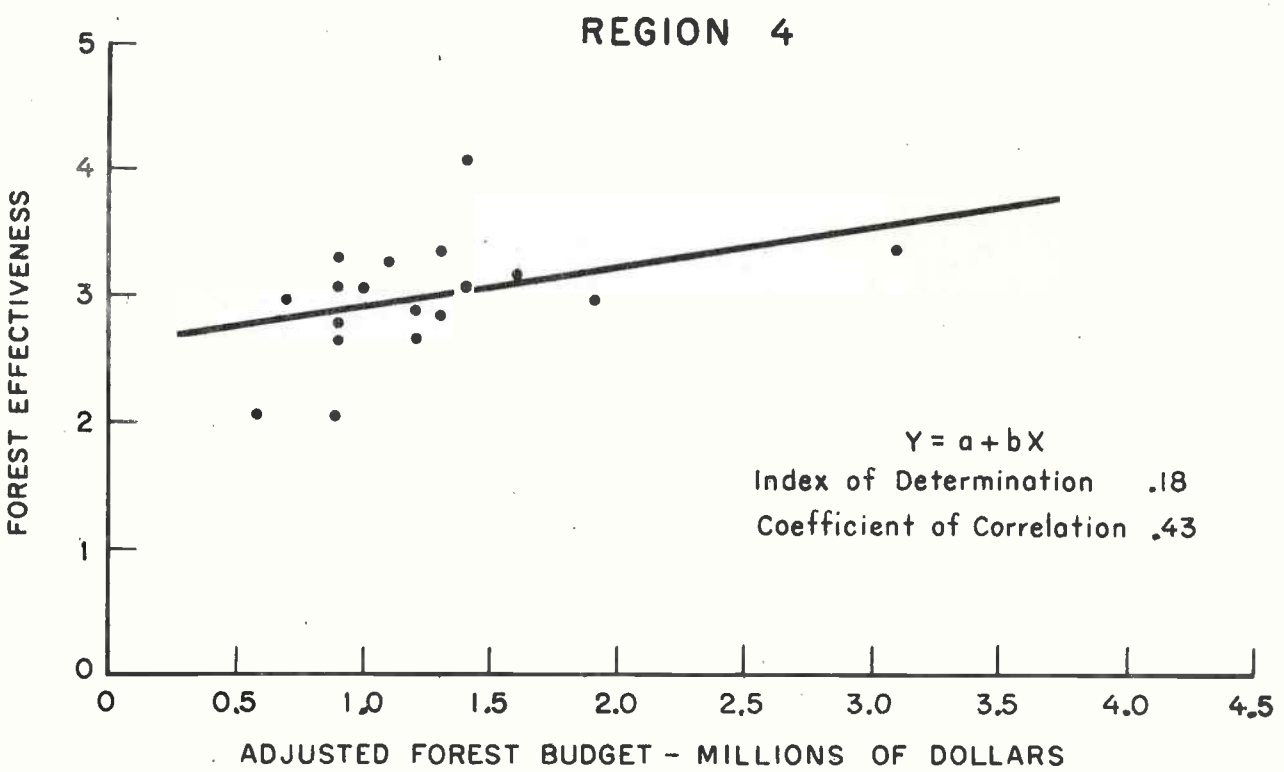


REGION 2



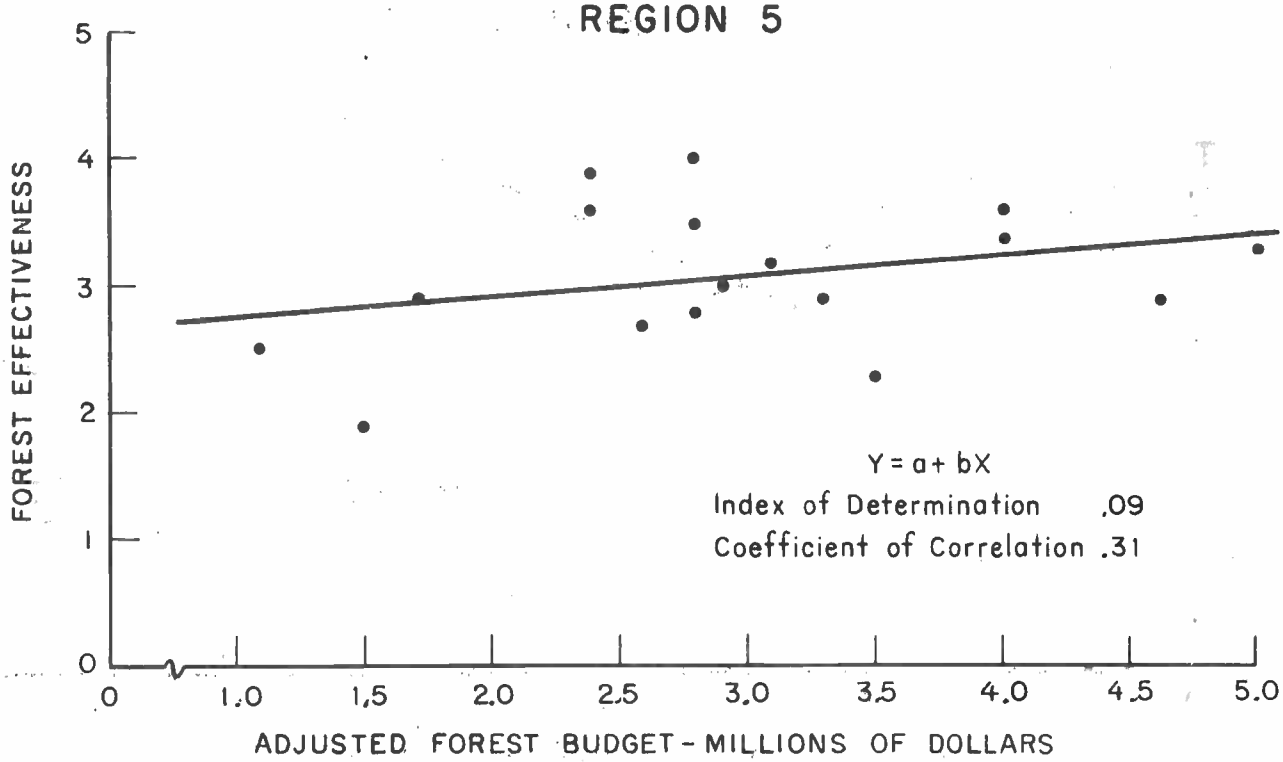
EFFECTIVENESS AS DETERMINED BY FOREST BUDGET



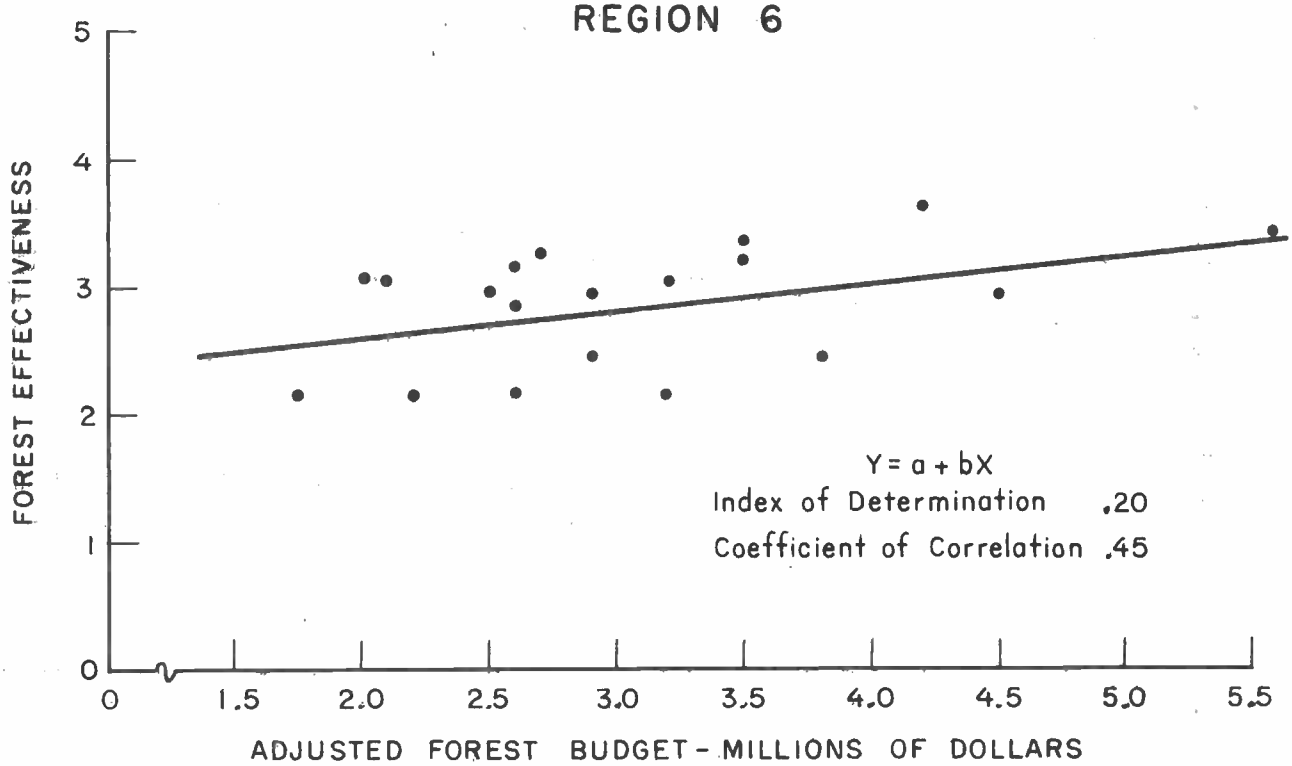


EFFECTIVENESS AS DETERMINED BY FOREST BUDGET

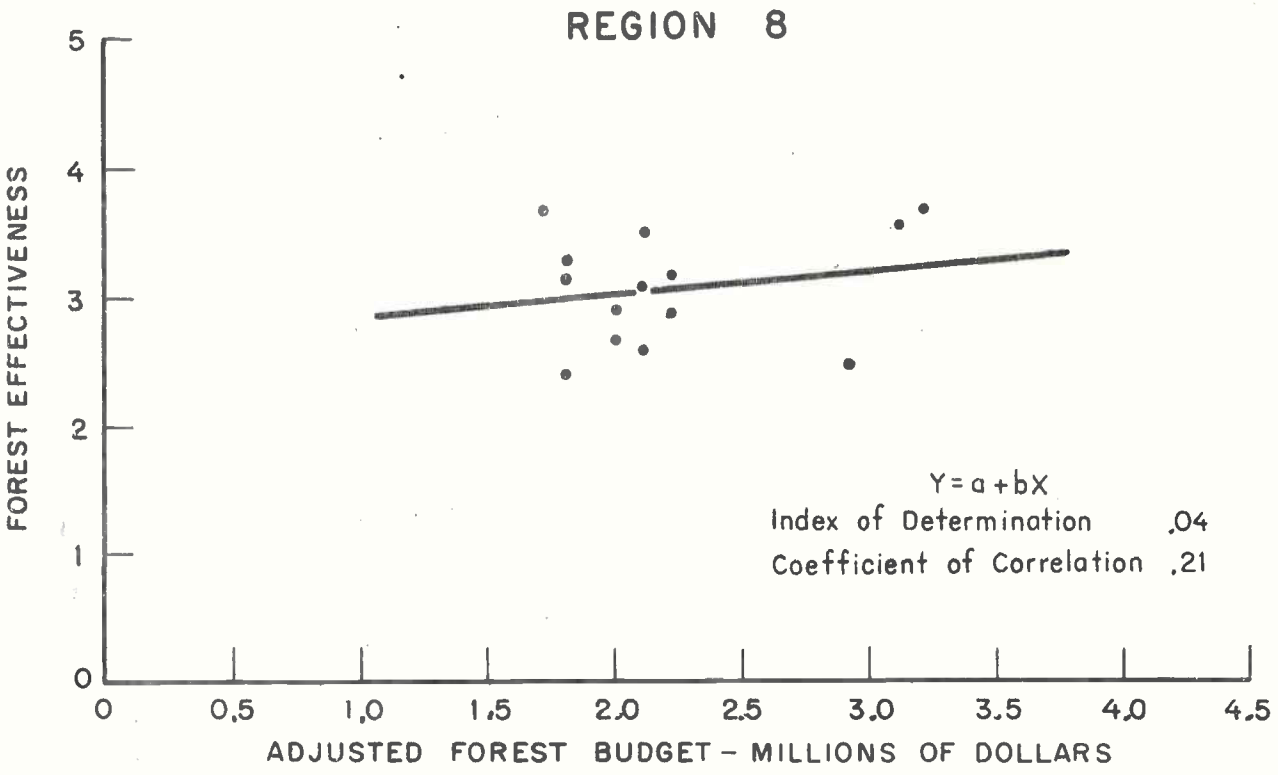
REGION 5

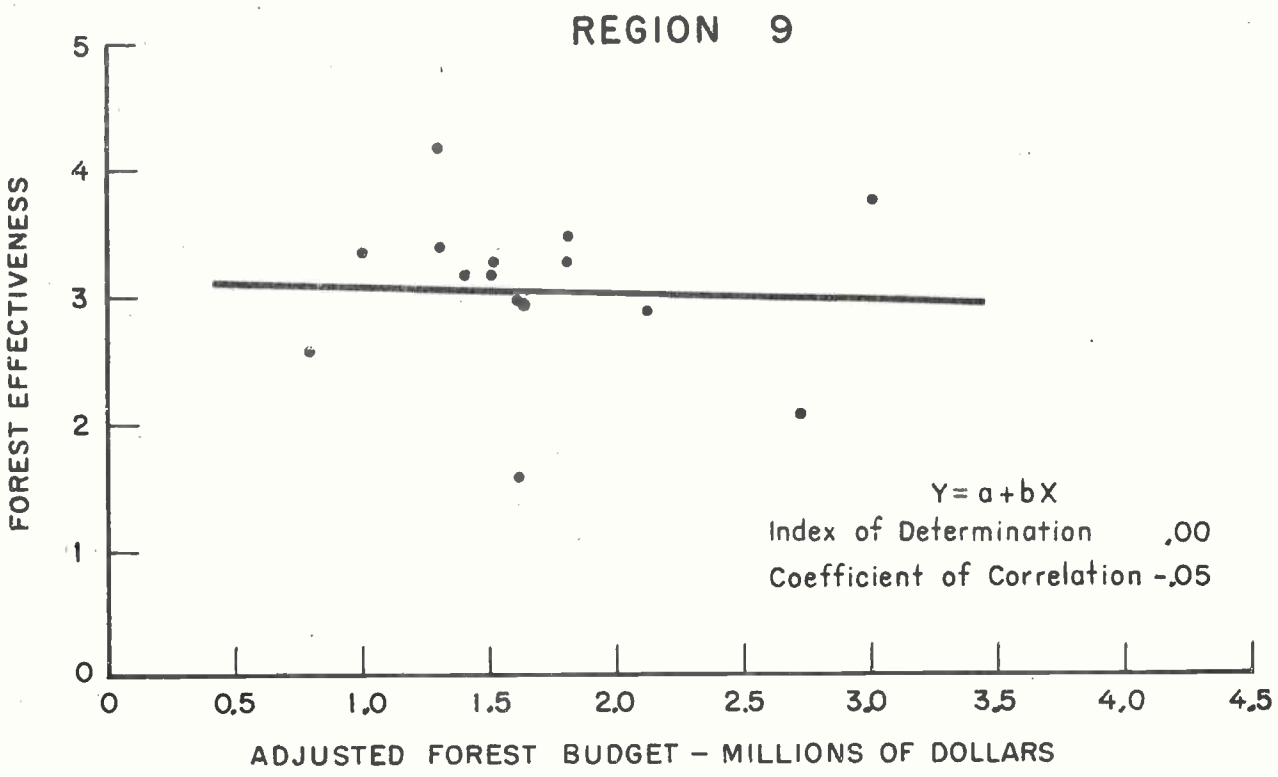


REGION 6



EFFECTIVENESS AS DETERMINED BY FOREST BUDGET





EFFECTIVENESS AS DETERMINED BY FOREST BUDGET

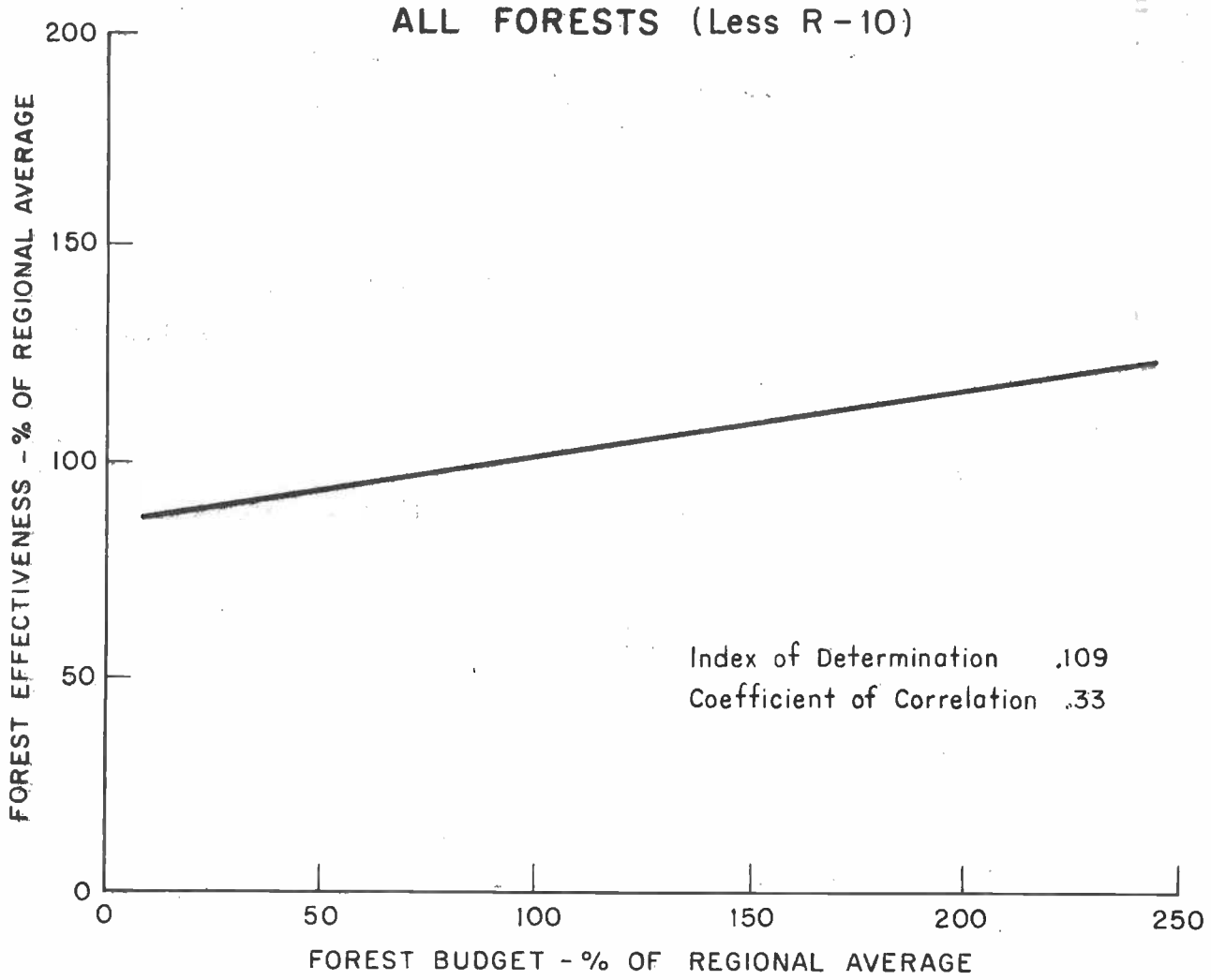
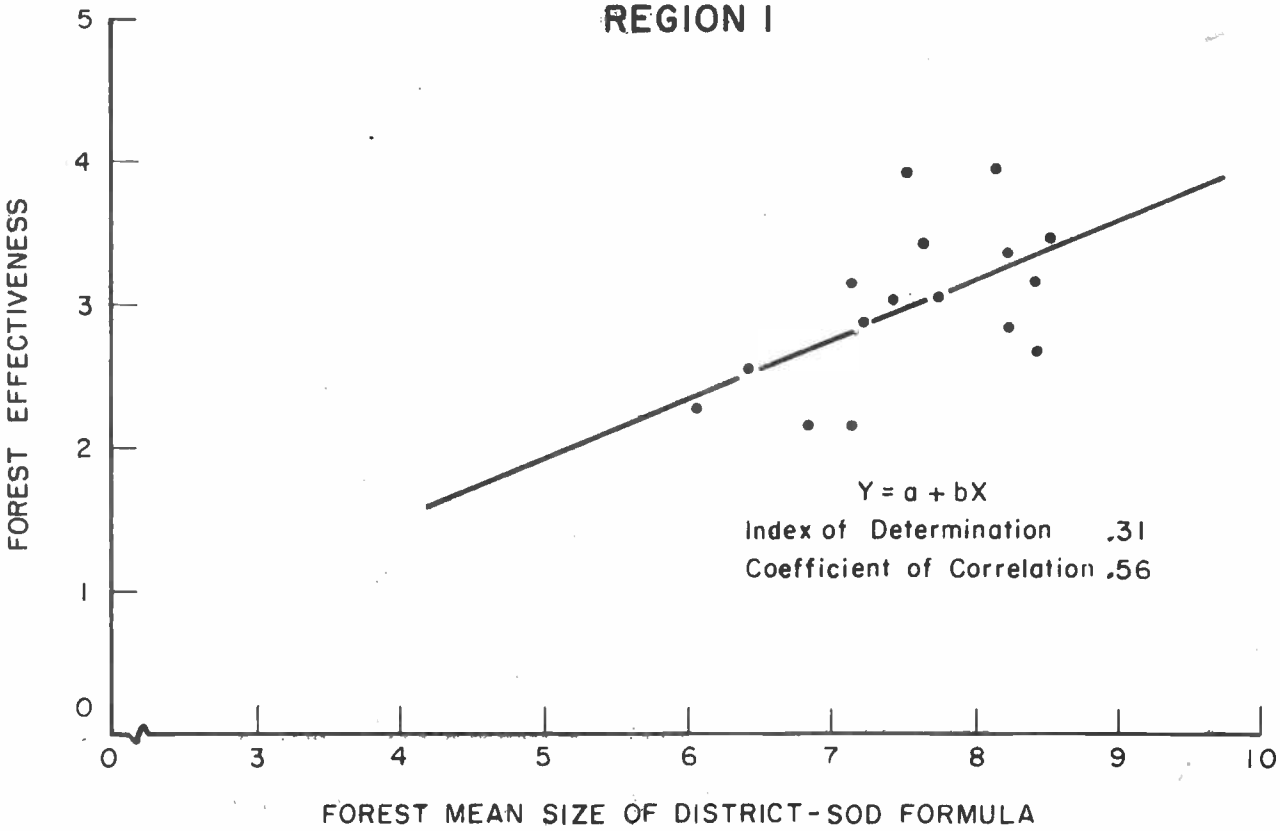
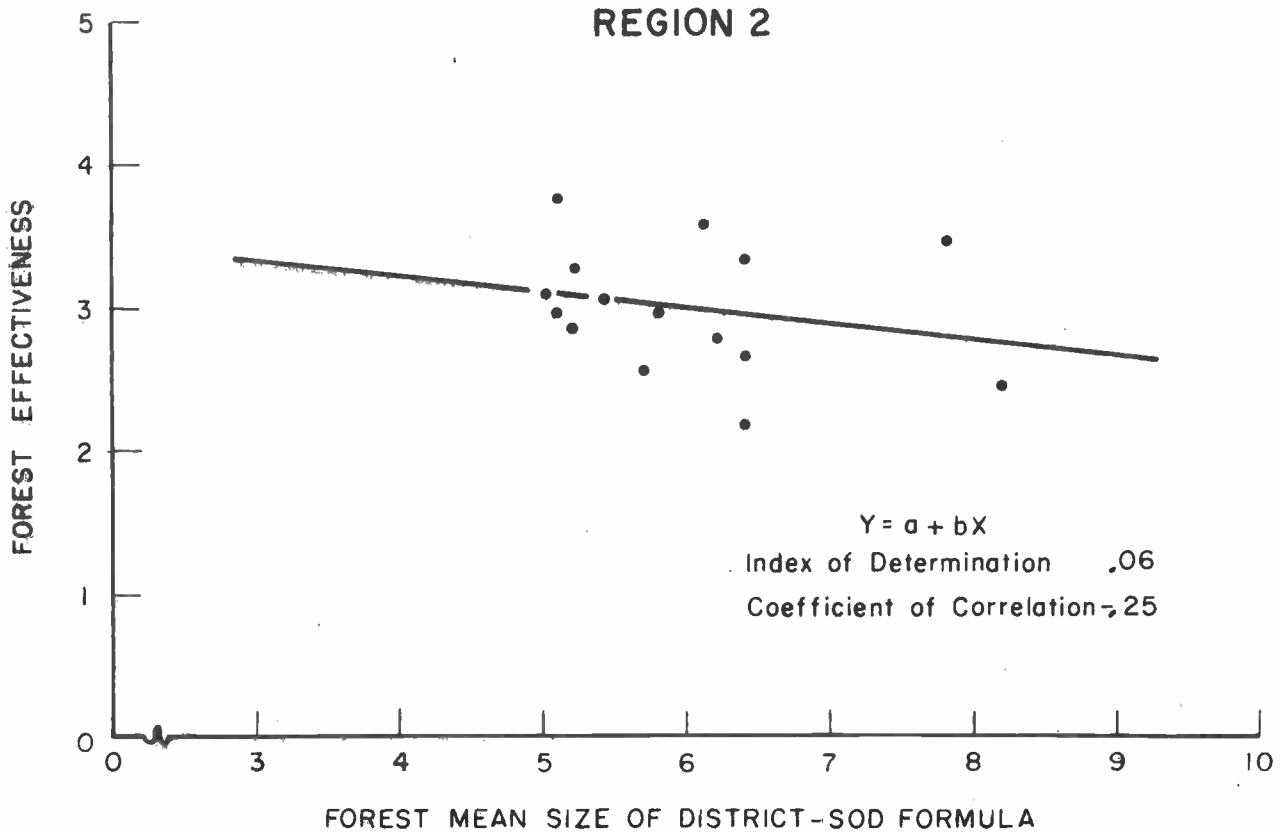


EXHIBIT 7

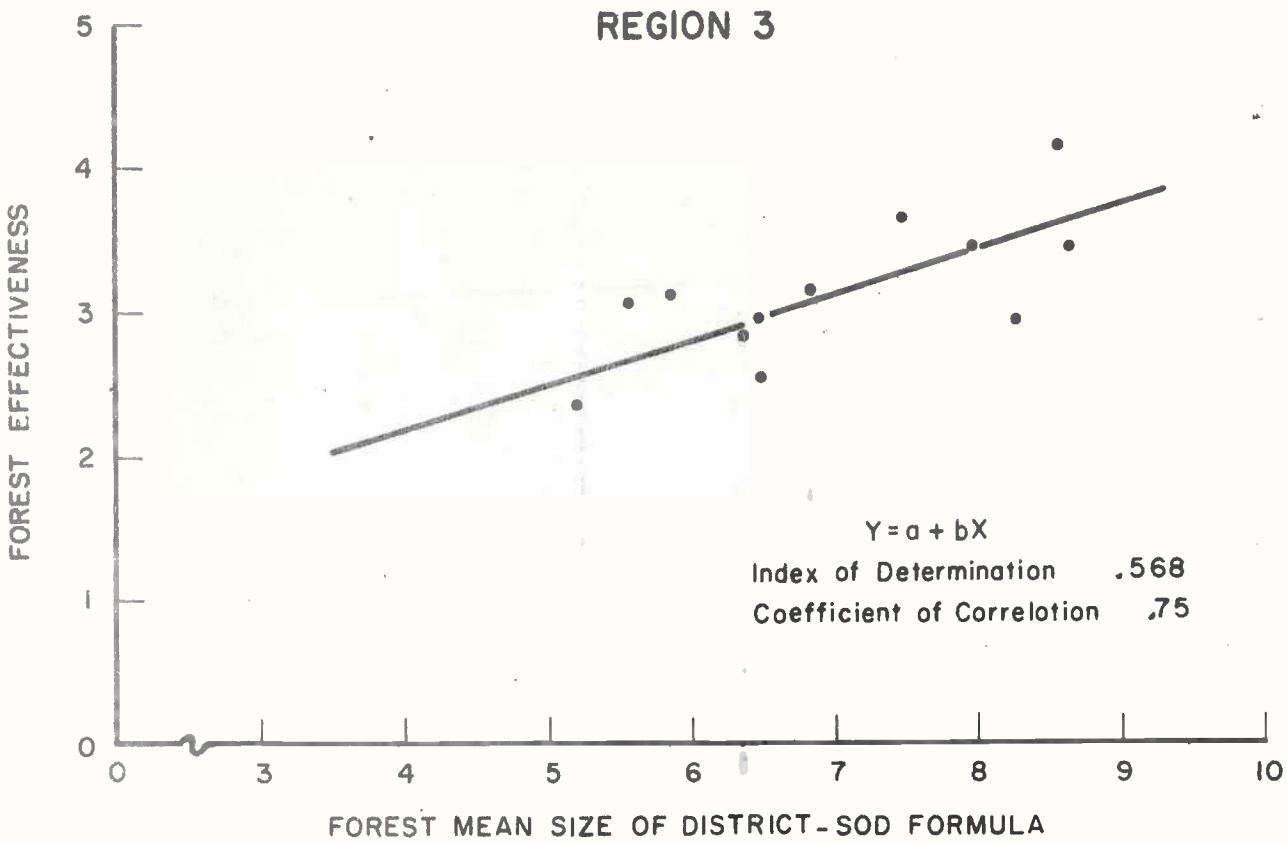
Forest Effectiveness Ratings Arrayed with Average Size of District Per Forest Using Size-of-District Formula.

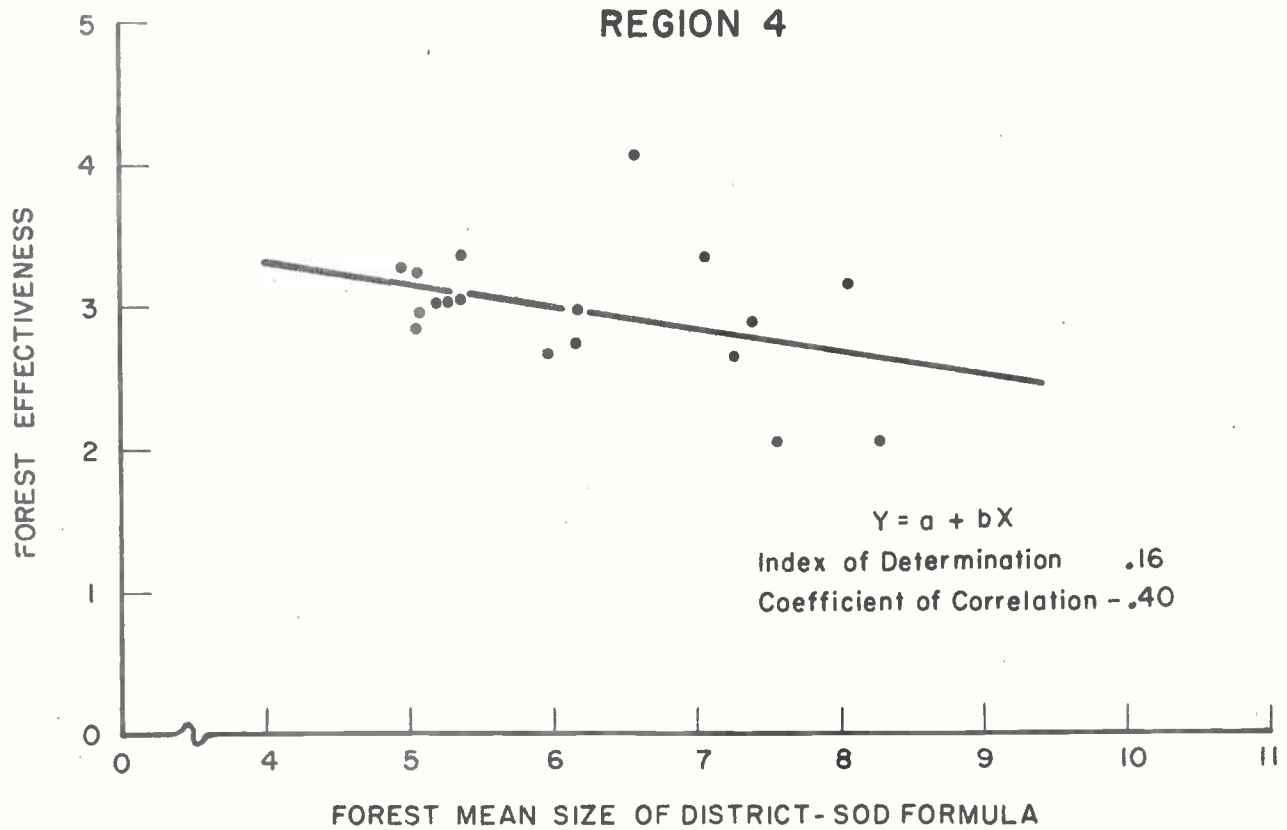
EFFECTIVENESS AS DETERMINED BY MEAN SIZE OF DISTRICT



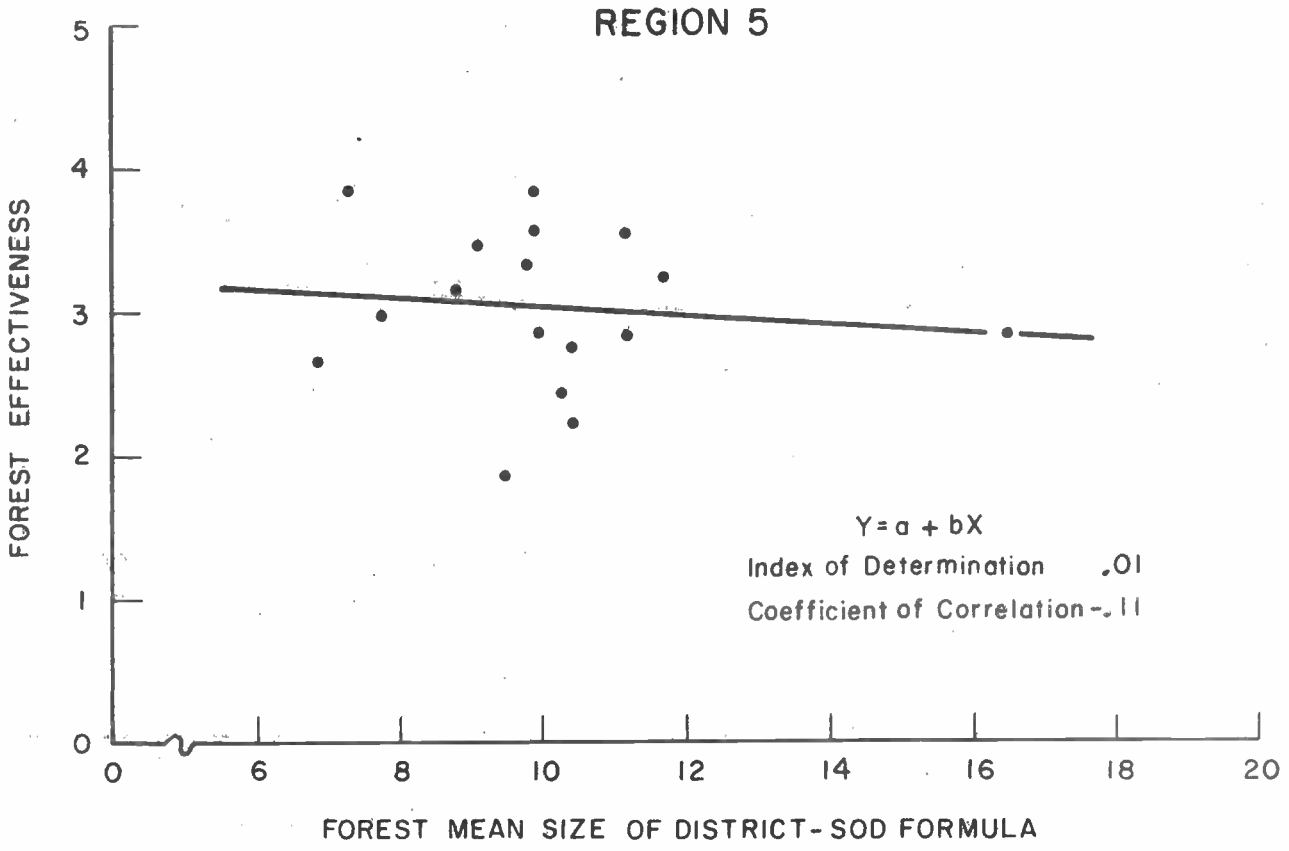


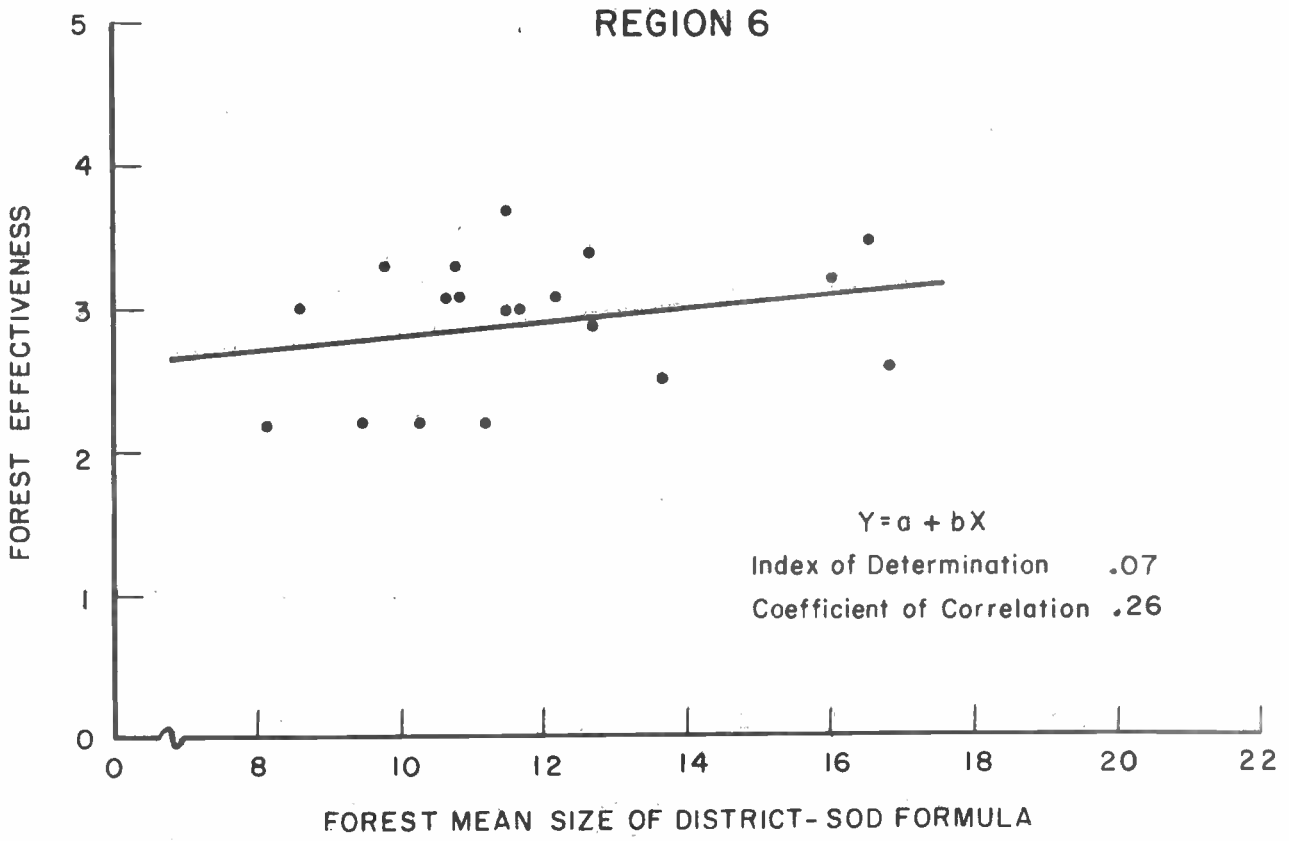
EFFECTIVENESS AS DETERMINED BY MEAN SIZE OF DISTRICT



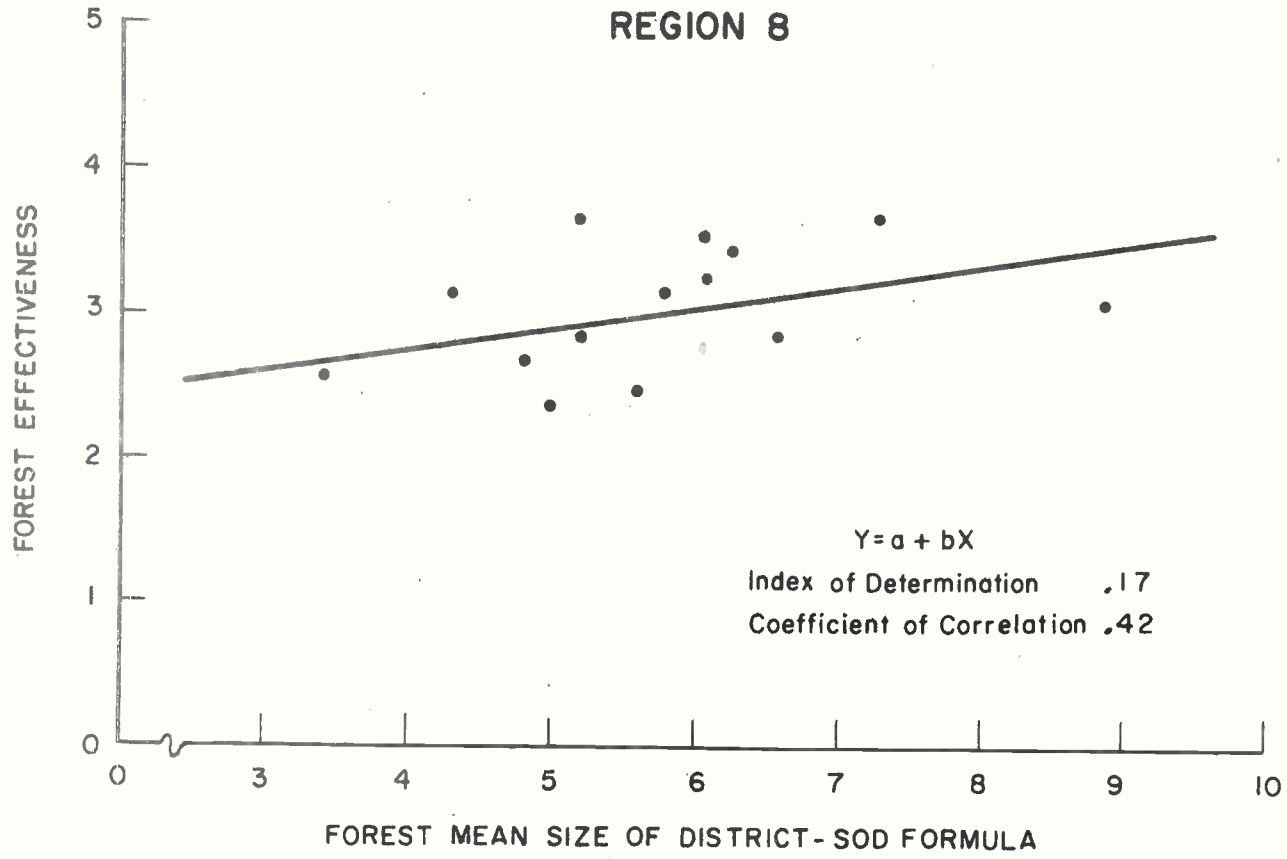


EFFECTIVENESS AS DETERMINED BY MEAN SIZE OF DISTRICT





EFFECTIVENESS AS DETERMINED BY MEAN SIZE OF DISTRICT



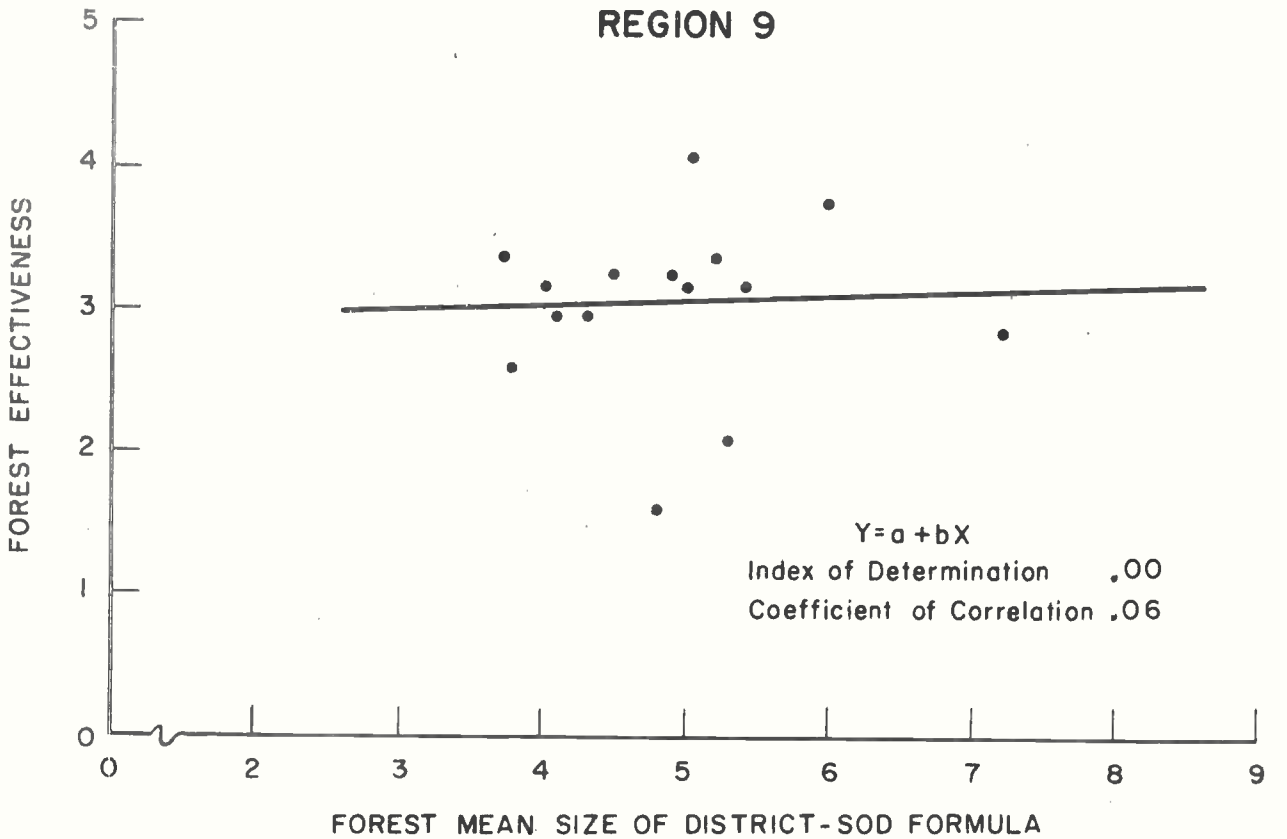


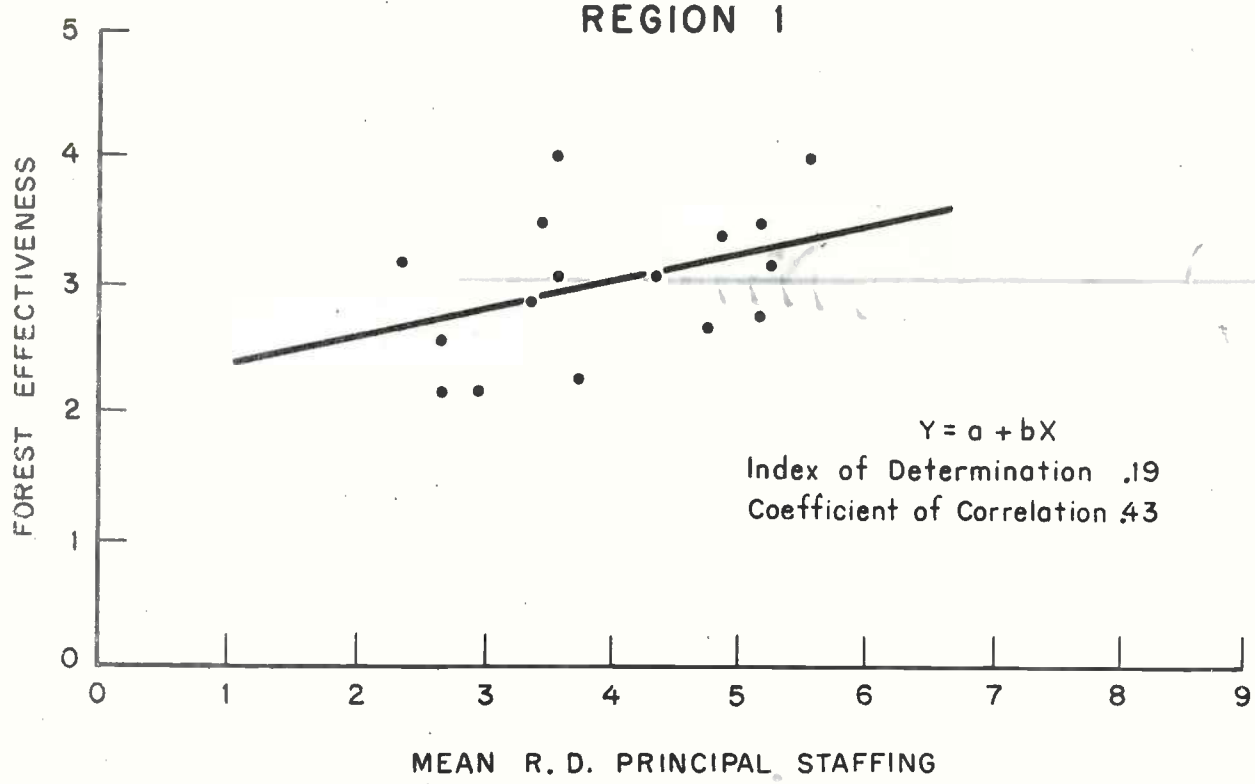
EXHIBIT 8

Forest Effectiveness Ratings Arrayed With Average Size of District Per Forest Using Average Number of Principal District Staff as Measure of District Size.

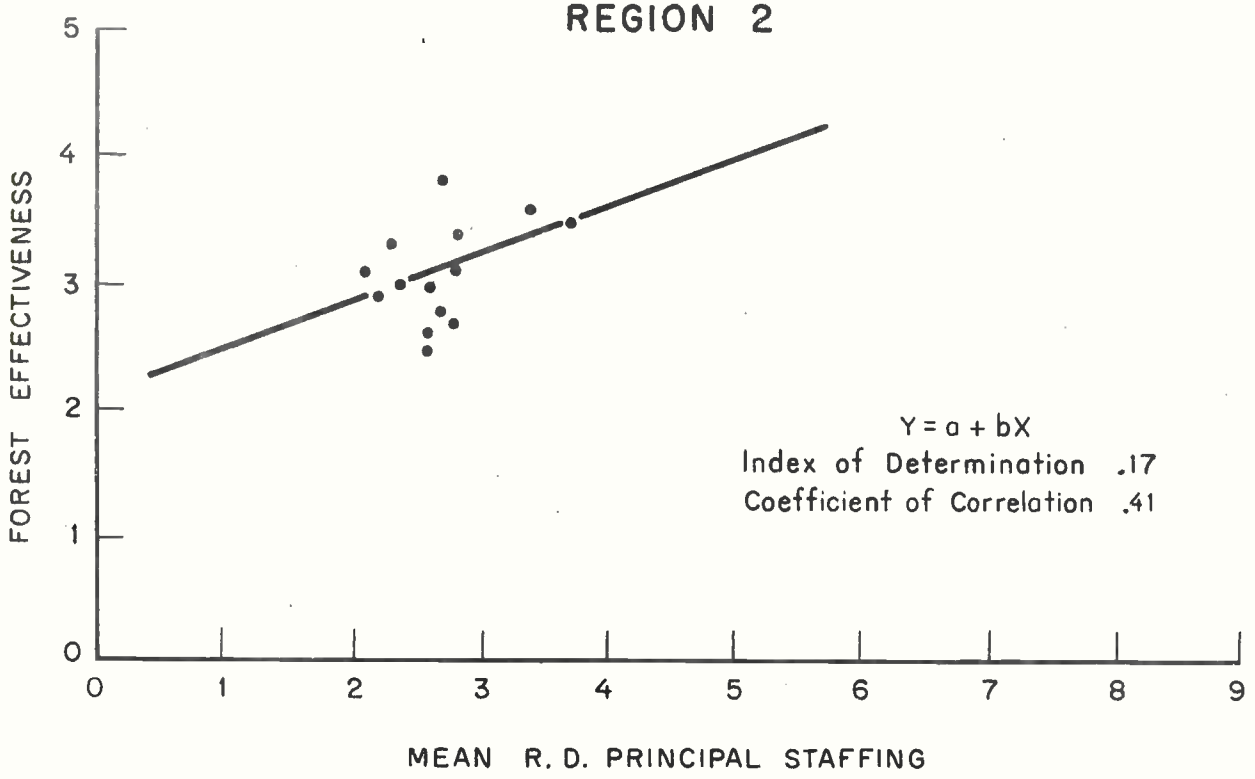
(Principal District Staff defined as the Professional Staff positions which have responsibility for resource management and protection functions. Includes District Ranger but does not include technicians or professional trainees.)

EFFECTIVENESS AS DETERMINED BY MEAN R. D. PRINCIPAL STAFFING

REGION 1

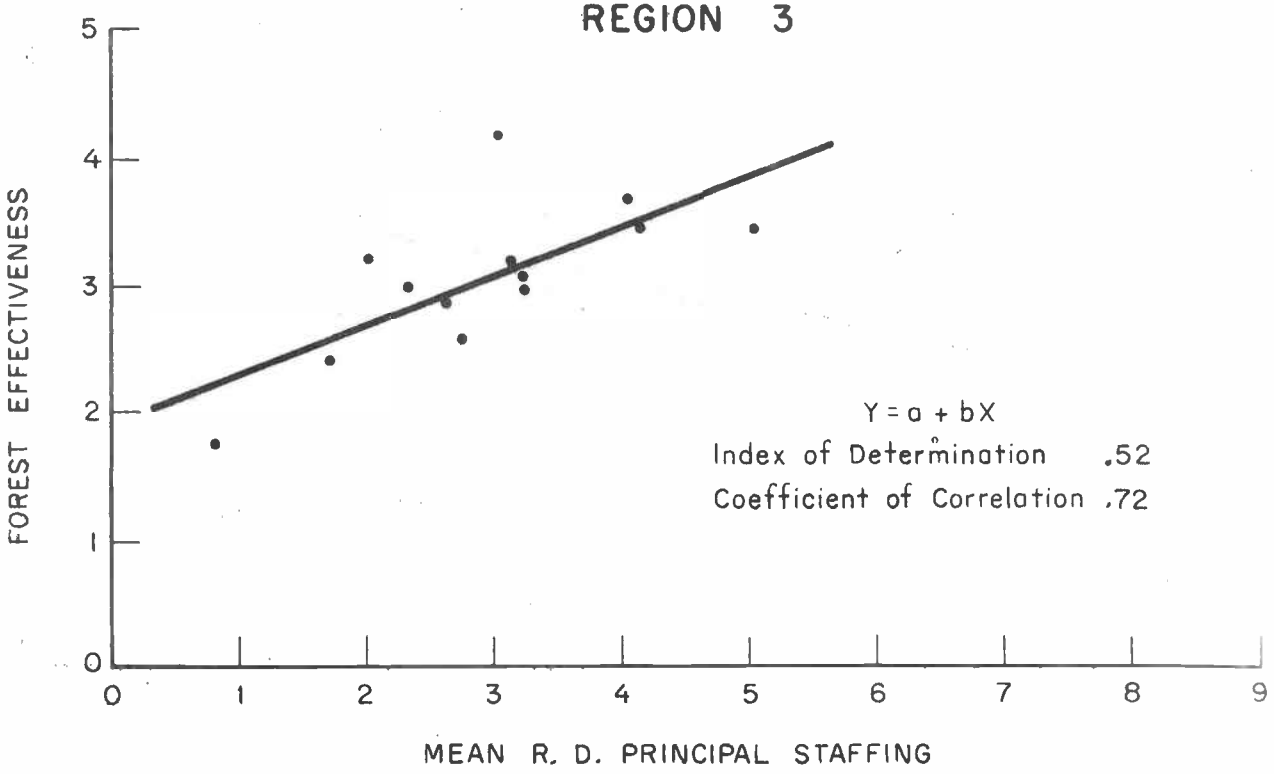


REGION 2

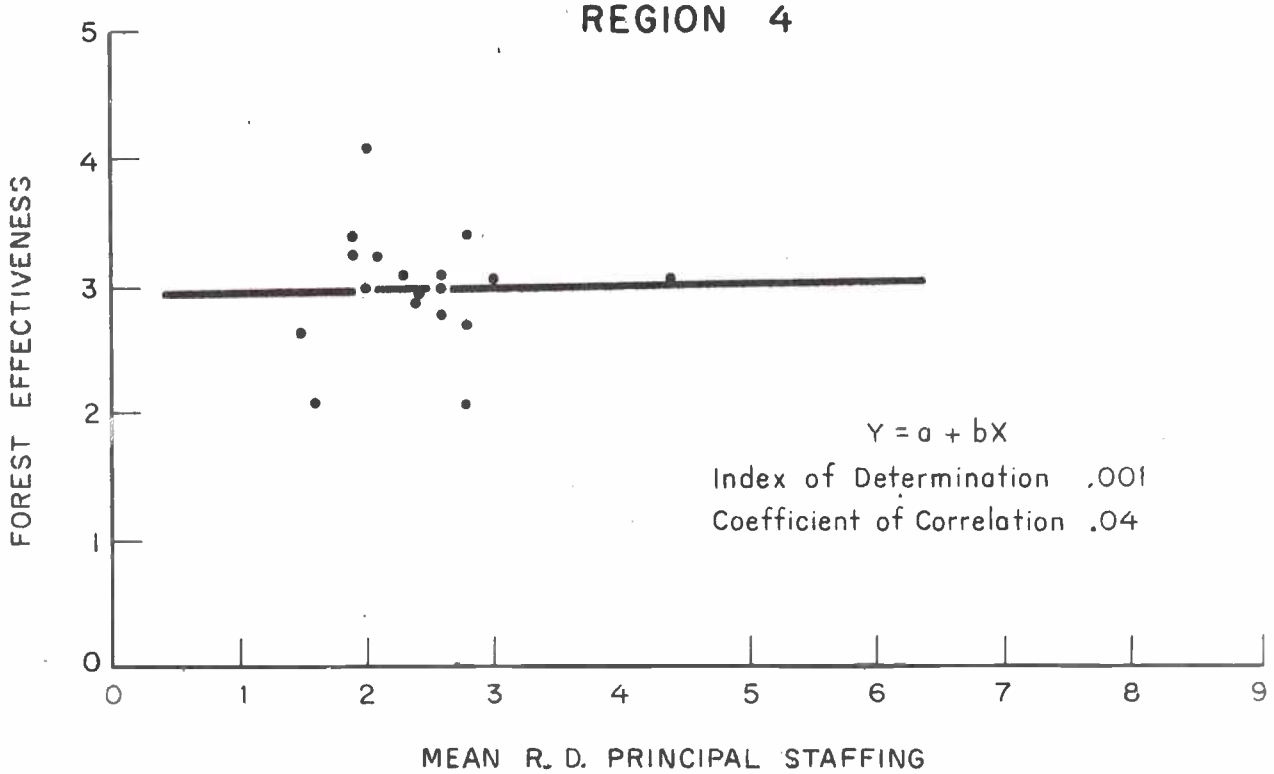


EFFECTIVENESS AS DETERMINED BY MEAN R. D. PRINCIPAL STAFFING

REGION 3

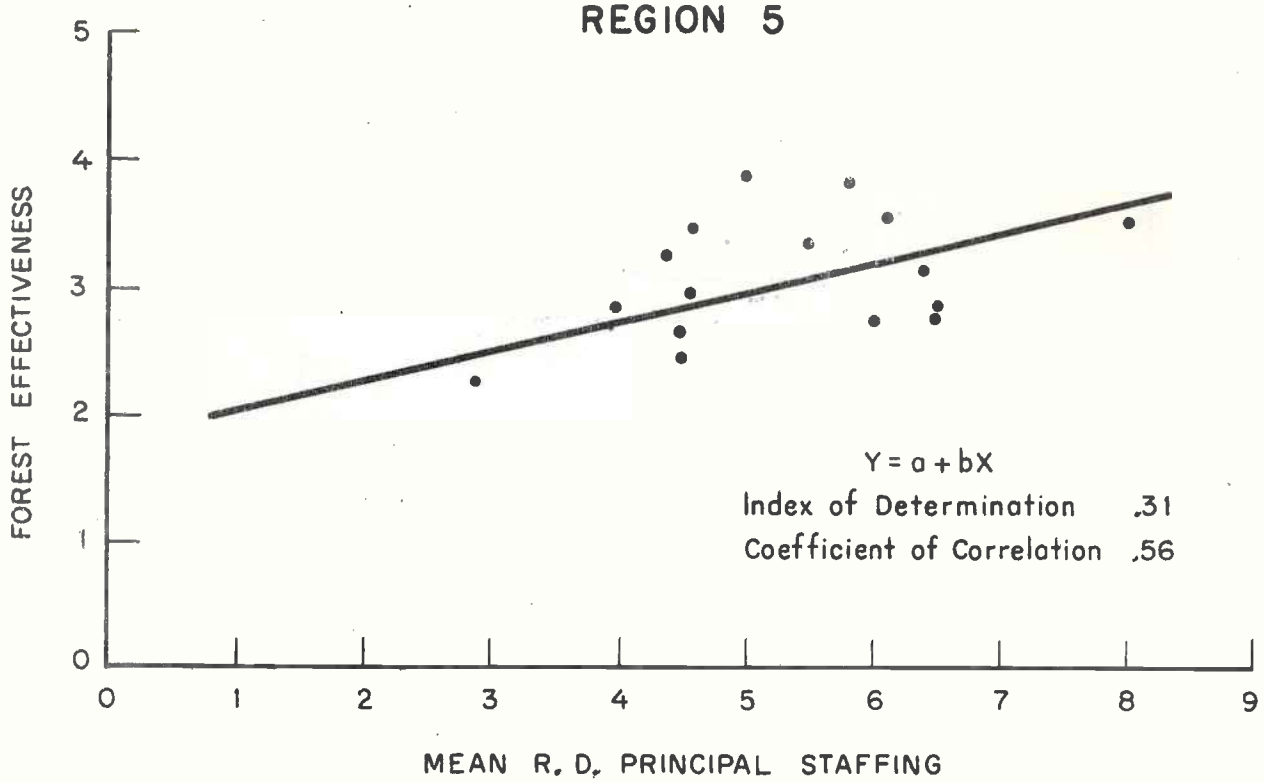


REGION 4

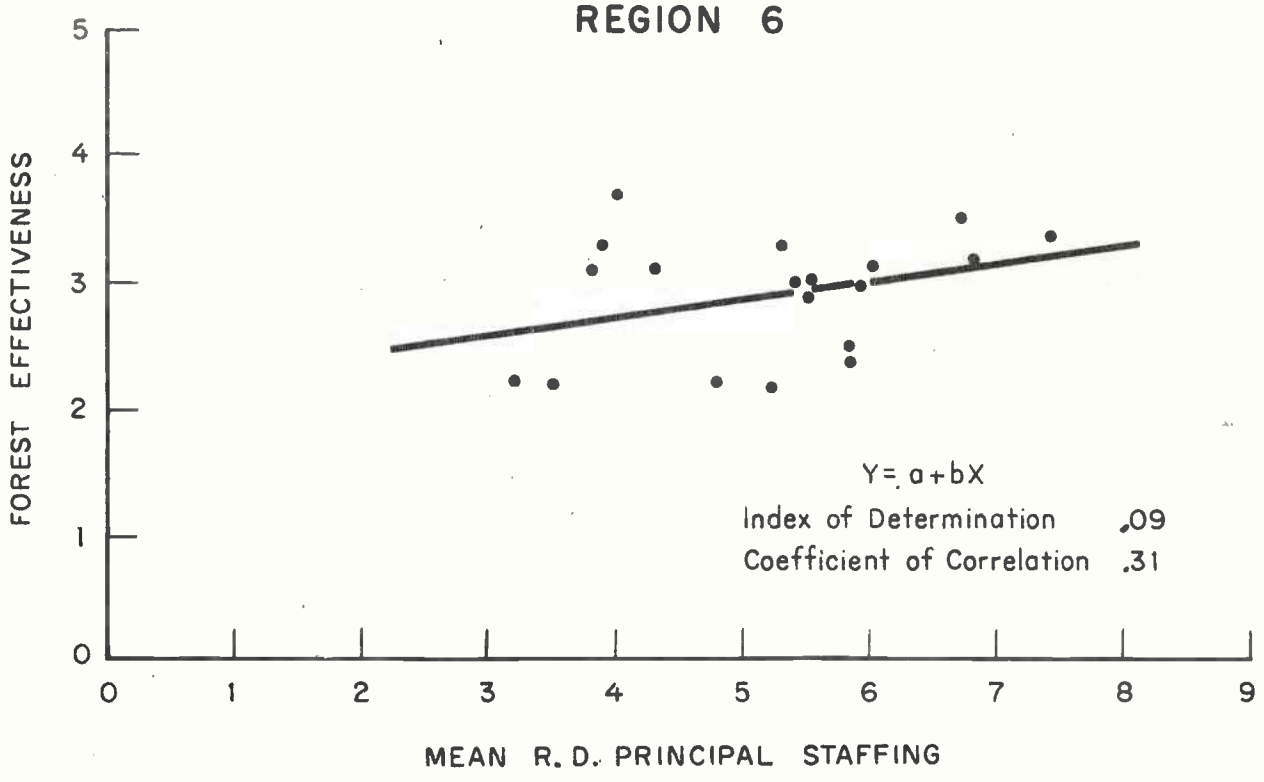


EFFECTIVENESS AS DETERMINED BY MEAN R. D. PRINCIPAL STAFFING

REGION 5

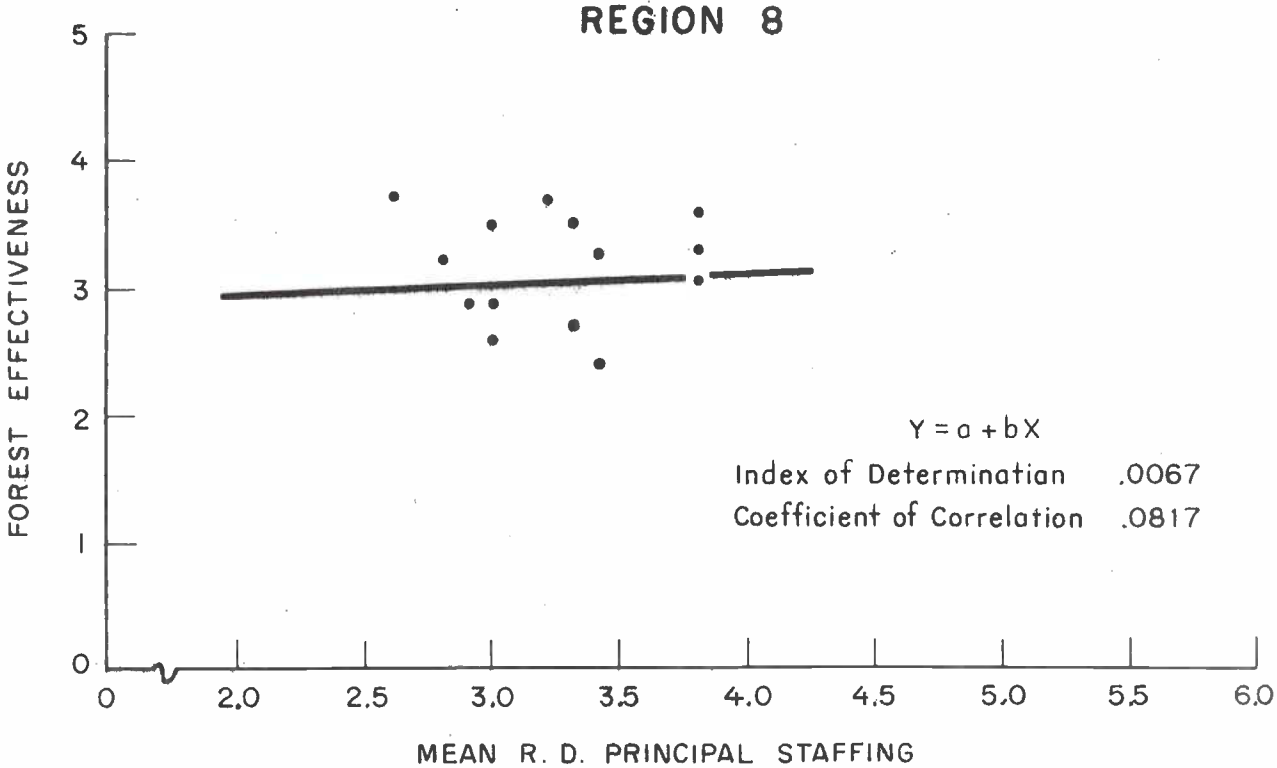


REGION 6



EFFECTIVENESS AS DETERMINED BY MEAN R. D. PRINCIPAL STAFFING

REGION 8



REGION 9

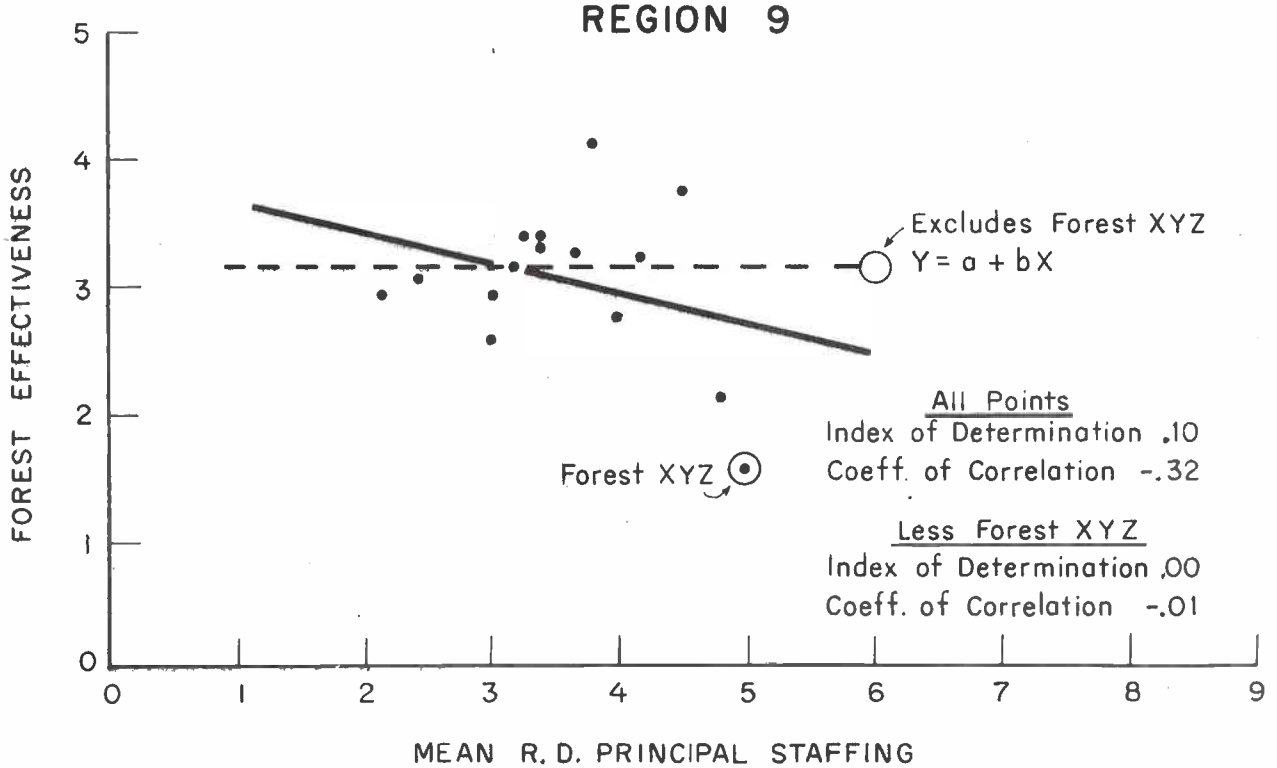


EXHIBIT 9

COMPUTATIONS SHOWING HOW VARIOUS MEASURES OF FOREST SIZE RELATE TO INDICATORS OF EFFECTIVENESS AND EFFICIENCY, AND TO EACH OTHER IN ONE SAMPLE REGION

(Placement by Quadrants)

A. S.O. Workload (1965 Base) Plus CCC Relationship to Indicators of Efficiency and Effectiveness

$$\text{Regional SO Workload Factor} = \frac{\text{SO Workload (M hrs. in SO Base + CCC)}}{24\ M}$$

(Allows 1530 hours for 200 man camp, 990 hours for 100 man camp)

Regional Rankings

1.	Santa Fe	0.94	7.	Coronado	0.61
2.	Coconino	0.84	8.	Gila	0.61
3.	Carson	0.84	9.	Sitgreaves	0.55
4.	Cibola	0.73	10.	Kaibab	0.51
5.	Apache	0.69	11.	Lincoln	0.50
6.	Tonto	0.64	12.	Prescott	0.44

Regional Average = 0.66

$$\text{Regional Composite Subunit Factor} = \frac{\text{SO Workload (M base + CCC hrs.)}}{3 \times \text{No. of Subunits (RD + CCC) per Forest}}$$

Regional Rankings

1.	Santa Fe	0.97	7.	Cibola	0.77
2.	Coconino	0.97	8.	Tonto	0.77
3.	Carson	0.97	9.	Coronado	0.70
4.	Sitgreaves	0.87	10.	Lincoln	0.67
5.	Apache	0.80	11.	Gila	0.63
6.	Kaibab	0.80	12.	Prescott	0.60

Regional Average - 0.79

Quad Placement - SO Workload (1965) Plus CCC Management

Quad I (Large Forest) (Small Dist.)	Quad II (Large Forest) (Large Dist.)	Quad III (Small Forest) (Large Dist.)	Quad IV (Small Forest) (Small Dist.)
Cibola	Santa Fe	Sitgreaves	Tonto
	Coconino	Kaibab	Coronado
	Carson		Gila
	Apache		Lincoln
			Prescott

1. **Efficiency (costs)**

(Cost of staffing M$ per MY financed workload and Business Management man-years per MM$ expenditure)

Quad I (Large Forest) (Small Dist.)		Quad II (Large Forest) (Large Dist.)		Quad III (Small Forest) (Large Dist.)		Quad IV (Small Forest) (Small Dist.)	
S	BM	S	BM	S	BM	S	BM
12.1	12.7	11.9	10.2	14.2	12.4	12.8	11.8
		9.4	9.7	12.8	13.9	11.4	11.6
		11.4	9.7			12.8	11.7
		12.5	12.2			14.4	11.3
						14.0	12.2

Average Cost of Forest staffing--M$

12.1	11.3	13.5	13.1

Average BM man-years per MM$ expenditure

12.7	10.5	13.2	11.7

Again we find Quadrants I and II higher in efficiency. (Large Forest, large and small subunits) (Lower costs)

2. **Effectiveness (ratings)**

Quad I	Quad II	Quad III	Quad IV
2.6	3.2	3.5	3.5
	4.2	3.0	3.0
	2.9		3.2
	3.7		3.1
			2.4
Average			
2.6	3.5	3.3	3.0

Again we find Quadrants II and III higher in effectiveness.
(Large subunits, large and small Forests)

3. Efficiency and Effectiveness (E&E) Indicators

We find that this measurement of Forest size develops the same picture of E&E as does the 1969 Base Workload. Either would do, both are not needed. We believe that Base SO Workload is an adequate measure of Forest size.

B. Total Forest Adjusted Budget Relationship to E&E

Total Forest budget is an indication of Forest size.

$$\text{Regional Forest Budget Factor} = \frac{\text{Adjusted Allotment (7/31/68, R3 1300-5)}}{\$2,100,000}$$

$$\text{Regional Composite District Budget Factor} = \frac{\text{Forest Adjusted Allotment}}{\text{No. of Districts} \times \$300,000 \text{ per Forest}}$$

The Forest adjusted allotment excludes contracts, WRD, and expanded Range.

A Forest with a 1.0 factor would have a budget of $2,100,000 and seven Ranger Districts.

Regional Array of Factors

Forest	Forest Factor	Composite Dist. Factor
Apache	.66	.77
Carson	.78	.78
Cibola	.53	.61
Coconino	.93	.93
Coronado	.60	.60
Gila	.57	.50
Kaibab	.58	.67
Lincoln	.55	.64
Prescott	.43	.50
Santa Fe	.80	.80
Sitgreaves	.60	1.04
Tonto	.67	.67
Regional Average	.63	.71

Forest Arrayed by Quadrants

Quad I (Large Forest) (Small Dist.)	Quad II (Large Forest) (Large Dist.)	Quad III (Small Forest) (Large Dist.)	Quad IV (Small Forest) (Small Dist.)
Tonto	Apache	Sitgreaves	Cibola
	Carson		Coronado
	Coconino		Gila
	Santa Fe		Kaibab
			Lincoln
			Prescott

1. Efficiency Indicators

(Cost of staffing M$ per MY financed workload and Business Management man-years per MM$ expenditure)

Quad I		Quad II		Quad III		Quad IV	
S	BM	S	BM	S	BM	S	BM
12.8	11.8	12.5	12.2	14.2	12.2	12.0	12.7
		11.4	9.7			11.4	11.6
		9.4	9.7			12.8	11.7
		11.9	10.2			12.8	13.9
						14.4	11.3
						14.0	12.2

Average Cost of Forest staffing--M$

12.8	11.3	14.2	12.9

Average BM man-years per MM$ expenditure

11.8	10.5	12.4	12.2

2. Effectiveness Indicators

Quad I (Large Forest (Small Dist.)	Quad II (Large Forest) (Large Dist.)	Quad III (Small Forest) (Large Dist.)	Quad IV (Small Forest) (Small Dist.)
3.5	3.7	3.5	2.6
	2.9		3.0
	4.2		3.2
	3.2		3.0
			3.0
			2.4
Average			
3.5	3.5	3.5	2.9

Again we find the large Forests indicated as more efficient than the small. Also, we find in this array that large and small Forests with large Districts appear to be more effective than small Forests with small Districts.

2. Efficiency and Effectiveness Indicators

It should be noted that this array of Forests into the four quadrants is identical with the array built with 1969 SO Workload as the size criterion, with the exception that the Tonto moved from Quadrant II to Quadrant I.

We find that adjusted budget, as an indicator of size, corresponds very closesy to other indicators of size, such as, SO Workload and SO Workload plus CCC. We can say that either SO Workload or Adjusted Budget appears to be adequate as measurements of Forest size.

C. Total Ranger District Workload (1965) Compared to Indicators of E&E

The total of all Ranger District Workloads is an indicator of Forest size.

$$\text{Regional Forest Size Factor} = \frac{\text{Sum RD Workloads (MY)}}{24}$$

$$\text{Regional Composite District Size Factor} = \frac{\text{Sum RD Workloads (MY)}}{4 \times \text{No. of Ranger Districts per Forest}}$$

Array of Forests

Forest	Total RD MY	Forest Factor	District Factor
Apache	16.9	.70	.70
Carson	19.3	.80	.69
Cibola	14.2	.59	.59
Coconino	22.1	.92	.79
Coronado	18.8	.78	.67
Gila	18.3	.76	.57
Kaibab	12.9	.54	.65
Lincoln	14.4	.60	.60
Prescott	13.6	.57	.57
Santa Fe	19.6	.82	.70
Sitgreaves	10.1	.42	.63
Tonto	20.8	.87	.74
Average	16.8	.70	.66

Forest by Quadrants

Quad I (Large Forest) (Small Dist.)	Quad II (Large Forest) (Large Dist.)	Quad III (Small Forest) (Large Dist.)	Quad IV (Small Forest) (Small Dist.)
Gila	Apache		Cibola
	Carson		Kaibab
	Coconino		Lincoln
	Coronado		Prescott
	Santa Fe		Sitgreaves
	Tonto		

1. Efficiency Indicators
(Cost of staffing M$ per MY financed workload and BM man-years per MM$ expenditure)

S	BM	S	BM	S	BM
12.8	11.7	12.5	12.2	12.0	12.7
		11.4	9.7	12.8	13.9
		9.4	9.7	14.4	11.3
		11.4	11.6	14.0	12.2
		11.9	10.2	14.2	12.2
		12.8	11.8		

Average cost of Forest staffing--M$

12.8	11.6	13.5

Average BM man-years per MM$ expenditure

11.7	10.9	12.5

2. Effectiveness Indicators

Quad I (Large Forest) (Small Dist.)	Quad II (Large Forest) (Large Dist.)	Quad III (Small Forest) (Large Dist.)	Quad IV (Small Forest) (Small Dist.)
3.2	3.7		2.6
	2.9		3.0
	4.2		3.1
	3.0		2.4
	3.2		3.5
	3.5		
Average			
3.2	3.4		2.9

3. Efficiency and Effectiveness Indicators

By arraying Forests into the four quadrants according to Total District Base Workload, the Forests shuffled somewhat differently. Large Forests (quadrants I and II) again are the most efficient, while large District Forests (Quad II) are the most effective. Although the distribution between quadrants is different, the trend is the same as the previous three arrays. Therefore, one or all of these factors are indicators of size showing expected E&E relationships and one will probably do.

D. Total Ranger District Budget (FY 1968) Compared to E&E

The total of all Ranger District Budgets is an indicator of Forest size.

$$\text{Forest size factor} = \frac{\text{sum of RD Budgets (M\$)}}{12}$$

$$\text{Composite District factor} = \frac{\text{sum of RD Budgets (M\$)}}{200 \times \text{No. of Ranger Districts per Forest}}$$

Array of Forests

Forest	Total RD Budget (M$)	Forest Factor	District Factor
Apache	629.4	.52	.52
Carson	674.7	.56	.48
Ci ola	461.9	.38	.38
Coconino	1094.4	.91	.78
Coronado	544.0	.45	.39
Gila	580.8	.48	.36
Kaibab	615.4	.51	.62
Lincoln	487.8	.41	.41
Prescott	331.0	.28	.28
Santa Fe	807.8	.67	.58
Sitgreaves	740.9	.62	.93
Tonto	642.5	.54	.46
Average	632.6	.53	.52

Forest by Quadrants

Quad I (Large Forest) (Small Dist.)	Quad II (Large Forest) (Large Dist.)	Quad III (Small Forest) (Large Dist.)	Quad IV (Small Forest) (Small Dist.)
Carson	Coconino	Apache	Cibola
Tonto	Santa Fe	Kaibab	Coronado
	Sitgreaves		Gila
			Lincoln
			Prescott

1. Efficiency Indicators

(Cost of staffing M$ per MY financed workload and BM man-years per MM$ expenditure)

S	BM	S	BM	S	BM	S	BM
11.4	9.7	9.4	9.7	12.5	12.2	12.0	12.7
12.8	11.8	11.9	10.2	12.8	13.9	11.4	11.6
		14.2	12.4			12.8	11.7
						14.0	11.3
						14.0	12.2

Average cost of Forest staffing--M$

12.1	11.8	12.7	12.9

Average BM man-years per MM$ expenditure

10.8	10.8	13.1	11.9

2. Effectiveness Indicators

Quad I (Large Forest) (Small Dist.)	Quad II (Large Forest) (Large Dist.)	Quad III (Small Forest) (Large Dist.)	Quad IV (Small Forest) (Small Dist.)
2.9	4.2	3.7	2.6
3.5	3.2	3.0	3.0
	3.5		3.2
			3.1
			2.4
Average			
3.2	3.7	3.4	2.9

3. Efficiency and Effectiveness

For the fifth time, using different size criteria, we find the large Forests most efficient, and large District Forests most effective.

All five different size criteria show the same trend. Any or all will suffice as size criteria. It should be noted that by using different criteria that some Forests show up in different quadrants. Yet, the quadrant averages of efficiency and effectiveness demonstrate that, by quadrant averages, larger Forests are more efficient, and the larger District Forests are more effective, without an exception in the sample Region.

E. Forest Acres as Size of Forest Factor

An array of Forest according to acres should demonstrate whether or not acres are significant when compared to efficiency and effectiveness.

$$\text{Regional Forest Size Factor} = \frac{\text{Total Net Forest Acres (MM)}}{3}$$

$$\text{Regional Composite District Factor} = \frac{\text{Total Net Forest Acres (MM)}}{1/2 \times \text{No. of Ranger Districts per Forest}}$$

Array of Forests

Forest	Net Acres (MM)	Forest Factor	District Factor
Apache	1.73	.58	.58
Carson	1.41	.47	.40
Cibola	1.66	.55	.55
Coconino	1.81	.60	.52
Coronado	1.79	.60	.51
Gila	2.69	.90	.67
Kaibab	1.72	.57	.69
Lincoln	1.09	.36	.36
Prescott	1.25	.42	.42
Santa Fe	1.45	.48	.41
Sitgreaves	0.77	.26	.39
Tonto	2.90	.97	.83
Average	1.70	.56	.53

Forests by Quadrants

Quad I (Large Forest) (Small Dist.)	Quad II (Large Forest) (Large Dist.)	Quad III (Small Forest) (Large Dist.)	Quad IV (Small Forest) (Small Dist.)
Coronado	Apache	Cibola	Carson
Coconino	Gila		Lincoln
	Kaibab		Prescott
	Tonto		Santa Fe
			Sitgreaves

1. Efficiency Indicators

(Cost of staffing M$ per man year financed workload and BM man years per MM$ expenditure)

S	BM	S	BM	S	BM	S	BM
11.4	11.6	12.5	12.2	12.0	12.7	11.4	9.7
9.4	9.7	12.8	11.7			14.1	11.3
		12.8	13.9			14.0	12.2
		12.8	11.8			11.9	10.2
						14.2	12.4

Average cost of Forest staffing--M$

10.4	12.7	12.0	13.2

Average BM man years per MM$ expenditure

10.7	12.4	12.7	11.2

2. Effectiveness

Quad I (Large Forest) (Small Dist.)	Quad II (Large Forest) (Large Dist.)	Quad III (Small Forest) (Large Dist.)	Quad IV (Small Forest) (Small Dist.)
3.0	3.7	2.6	2.9
4.2	3.2		3.1
	3.0		2.4
	3.5		3.2
			3.5
Average			
3.6	3.4	2.6	3.0

3. Efficiency and Effectiveness

We do not find the same correlation between acres and E&E as we did with the other five size criteria. The array by quadrants shows the most efficient Forests in staff costs to be large Forest-small District and small Forest-large District. The most efficient in BM man-years are the large Forest-small District and small Forest-small District. This appears meaningless and contradictory. It appears the most effective are the large Forests-large and small Districts which does not correlate with the other five size criteria which indicated large Forests-large Districts and small Forests-large Districts are the most effective.

Acres do not appear to be a meaningful size criterion to relate efficiency and effectiveness to National Forest units.

The following pages summarize the numerical Forest averages for effectiveness and efficiency indicators according to size measure, and the Forests in the sample Region can then be arranged as to effectiveness and efficiency on a scale of:

a. M^1 = Most effective or efficient

b. M^2 = More effective or efficient

c. L^1 = Less effective or efficient

d. L^2 = Least effective or efficient

Definitions

a. Large Forests are above Regional average in size.

b. Small Forests are below Regional average in size.

c. Large Districts are Ranger Districts with size factors above Regional average.

d. Small Districts are Ranger Districts with size factors below Regional average.

e. Effectiveness is the average of all Forests falling within a given quadrant.

f. Efficiency is the percent of financed Supervisor and Resource staff workload actually staffed and is the average of all Forests falling within a given quadrant. The lower the percentage, the higher the efficiency.

EFFECTIVENESS (Regional Average - 3.2)

Size Factor	L. Forest S. Dist.	L. Forest L. Dist.	S. Forest L. Dist.	S. Forest S. Dist.
1969 WL	-	3.5	3.5	2.9
1965 WL & CCC	2.6	3.5	3.3	3.0
Total Forest Adj. Budget	3.5	3.5	3.5	2.9
Total R.D. WL	3.2	3.4	-	2.9
Total R.D. Budget	3.2	3.7	3.4	2.9
Net Forest Acres	3.6	3.4	2.6	3.0
Average	3.2	3.5	3.3	2.9

EFFICIENCY (Regional Average - 94%)

Size Factor	L. Forest S. Dist. %	L. Forest L. Dist. %	S. Forest L. Dist. %	S. Forest S. Dist. %
1969 WL	-	87	109	97
1965 WL & CCC	90	86	104	97
Total Forest Adj. Budget	93	86	109	97
Total R.D. WL	97	86	-	102
Total R.D. Budget	90	90	96	97
Net Forest Acres	76	95	90	100
Average	89	88	102	101

EFFECTIVENESS INDICATORS

Method for Arraying Effectiveness Classes (average effectiveness indicators of all Forests in sample Region within size class definitions)

Class	Average Rating Range
Most (M^1)	3.5 and over
More (M^2)	3.2 to 3.4
Less (L^1)	3.0 to 3.1
Least (L^2)	2.9 and below

Scale for Forests in Sample Region

Size Factor	L. Forest S. Dist.	L. Forest L. Dist.	S. Forest L. Dist.	S. Forest S. Dist.
1969 SO WL	--	M^1	M^1	L^2
1965 SO WL & CCC	L^2	M^1	M^2	L^1
Total Forest Adj. Budget	M^1	M^1	M^1	L^2
Total R.D. WL	M^2	M^2	--	L^2
Total R.D. Budget	M^2	M^1	M^2	L^2
Total Forest Acres	M^1	M^2	L^2	L^1

EFFICIENCY INDICATORS

Method for Determining Efficiency Classes (average efficiency indicators of all Forests in Sample Region within size class definition)

Class	Average Rating Range
Most (M^1)	86% or less
More (M^2)	87 - 91%
Less (L^1)	92 - 99%
Least (L^2)	100 - 109%

Size Factor	L. Forest S. Dist.	L. Forest L. Dist.	S. Forest L. Dist.	S. Forest S. Dist.
1969 SO WL	--	M^2	L^2	L^1
1965 SO WL & CCC	M^2	M^1	L^2	L^1
Total Forest Adj. Budget	L^1	M^1	L^2	L^1
Total R.D. WL	L^1	M^1	--	L^2
Total R.D. Budget	M^2	M^2	L^1	L^1
Total Forest Acres	M^1	L^1	M^2	L^2

(Above summary also shown on page 47 of the report)

EXHIBIT 10

REGIONAL METHODS AND MODEL FOR ESTIMATING POTENTIAL COSTS OF CHANGE

1. Region One Method

The costs of closing a small, a medium, and a large Forest Supervisor's Office in Region 1 were estimated as shown in the following table.

Estimated Costs of Closing Sample National Forests

Region 1

Item	Costs Forest A	Forest B	Forest C
Cost of moving people and things*	$121,935	$54,000	$30,500
Cost of consolidating files--SO and RO	1,600	780	1,150
Cost of changing signs and maps	92,100	28,500	18,000
Cost of additional I&E work	5,700	1,500	1,750
Cost of changing records	677	1,000	220
Cost of loss of production	48,400	15,230	10,725
Total	270,412	$101,010	$62,345

Forest Characteristics

No. of Districts	8	6	6
No. of Permanent Employees	135	67	52
Net Acres (M)	2,086	1,701	1,835
FY 1968 Adjusted Budget	2,414	1,263	1,184
CWL hours (1965)	17,896	14,749	12,478

*Method assumes that all PFT professionals will move, but locally employed PFT Clerical employees would probably separate.

2. Region Three Model (Costs of Change)

If a Supervisor's Office is absorbed by another, in total or in part, the costs which can be expected are so numerous that any attempt to list them all is futile. There may be hundreds of particulars from moving people to notifying newspapers. Things like maps and signs require consideration. For the purpose of this study, there is a point of diminishing returns in examining minute costs. There are, however, several areas of costs which may be applied to any consolidation. These encompass most of the total cost, which are simple to apply, and from which a cost model can be constructed.

a. Cost Areas

Four areas of cost which fall in this category are:

(1) Cost Difference in Office Space

A standard cost per square foot per person is used throughout the R-3 model. The cost (and savings) if any, is a reflection of the total number of people assigned to a Supervisor's Office. If, in a consolidation, the number of people is reduced, the amount of office space required is reduced proportionately.

(2) Cost of Moving Things

In order to construct a consistent manner for computing this cost, certain assumptions are made. Everything in a closed office must be moved somewhere. All record files will go to the new headquarters. A weight factor for personal office furniture and working aids can be developed for each SO employee. Perhaps all material will not be needed at new headquarters, but will have to be packed and shipped somewhere, or disposed of at some cost. Weight of materials, not directly supportive to individuals, can be estimated. We can test the hypothesis that the percentage of materials going to the new headquarters will relate to the percent of people who will move.

(3) Cost of Moving People

Again we will make an assumption. All GS-5 employees, and above, and PFT personnel, will probably move. The others will separate. Some higher grade employees may separate and some lower grade may move. But this average grade level break appears adequate for model purposes. This should give us a percent of total people to apply to the abolished Supervisor's Office group to arrive at a number of transferees. This number can be multiplied by the average Regional transfer cost to determine total cost of moving people.

(4) Loss of Production

Production is lost in preparing for a move, moving, and realigning after a move. Factors are to be built here. Discussions with AO's and Supervisor's staffs allowed us to develop the following loss of production factors:

(a) Supervisor and staff - all concerned Forests - 1 pay period each.

(b) Each specialized staff - going to new Forest - 1 pay period each.

(c) Each BM employee - going to new Forest - 1 pay period each.

(d) Each BM employee on receiving Forest - 1/2 pay period each.

b. Cost of Consolidation Models

Models of Cost of Consolidation can be built using the four cost areas described. These models can be used for comparative purposes between alternatives. It is recognized that they are models only and are not specific enough for each particular consolidation. Additional cost items would be determined on specific bases, which might vary a great deal, Forest by Forest. But, as we said, comparative models can be used to compare possibilites.

(1) Cost of Consolidation Model - Two Forests to One Forest

A new headquarters organization, for space purposes, is determined as follows - Total new organization = larger organization plus one half of the smaller organization.

From discussions on the sample Forests, the formula might give an adequate collection of SO groups, in total, and generally close for any one group. In the revised column of the model, shown on the next page, the Supervisor and primary staff group would not increase in staff, but perhaps would increase by one Deputy Supervisor (8). There may, then be required more specialized staff help, which in this model equals one half of the number of the smaller, plus any shift from Supervisor and primary staff group in the specialized group (11). The Engineering and Business Management groups on the combined Forest may be pretty close to the sum of the larger Forest plus one half the smaller (22 and 26).

Group	A	C	Forest AC	AC Revised
Supervisor & Primary Staff	7	6	10	8
Specialized Staff	7	3	9	11
Engineering Staff	19	7	22	22
Business Management	19	14	26	26
Total	52	30	67	67

(Note - The Model combines Forest A, a large Forest in R-3 with Forest C, a small Forest in R-3)

Since Forest A is absorbing Forest C, the space requirements will increase from 10,400 square feet, or $36,400, for Forest A to 13,400 square feet, or $46,900, for Forest AC. The difference is a cost of consolidation. The closure of Forest C would be a savings and is considered in the savings portion of the study model.

(2) Cost of Moving Things

Forest C to Forest A		lbs.
(a)	Record files (from inventories)	2,600
(b)	Office material (700# x 30 people, estimated by each office & averaged)	21,000
(c)	Other material (only material, no project)	7,200
	Total Things	30,800

Approximately 15 people will go to the new Forest. This is 50% of the existing number on Forest C. Therefore, 50% of "things" must go to Forest AC, except record files. Thus, (28,200 lbs. x 50%) + (2,600 lbs. x 100%) = 16,700 lbs. to be moved.

Cost of Moving Things = 16,700 lbs. x $5.00/cwt. = $835.00.

The other 14,100 lbs. will be surplus and cost of moving borne by receiving unit.

(3) Cost of Moving People

We assume, to find an average, that all permanent full-time employees, GS-5 and above (or WB-5), will transfer, either to the new headquarters or to another unit. All others will terminate.

In the model, Forest C has 30 permanent employees. Twenty-three employees will transfer and 7 will separate.

The Region 3 average for transfer of station is $1,100.

23 employees x $1,100 = $25,300 Cost of Moving People.

(4) Loss of Production

(a) Supervisor plus Primary Staff (both Forests)
13 x 1 PP = 13 PP x $550.00 = $7,150

(b) Specialized Staff (Forest C)
10 x 1 PP = 10 PP x $350.00 = $3,500

(c) BM Employees (Forest A)
19 x 1/2 PP = 10 PP x $250.00 = $2,500

(d) BM Employees (Forest C to Forest AC)
7 x 1 PP = 7 PP x $250.00 = $1,750

Total - 40 pay periods = $14,900

(5) Summary of Major Costs

(a)	Difference in Office Space Costs (Forest A and C to Forest AC)	= $10,500
(b)	Cost of Moving Things	= $ 835
(c)	Cost of Moving People	= $25,300
(d)	Loss of Production	= $14,900
(e)	Estimated cost of Changing Signs and Maps	= $25,000
	Total	= $76,535

3. The Region 1 sample establishes an estimated range of about $62,000 to $270,000 for closing costs. The Region three model shows an estimated one-sample closing cost of about $76,000. The R-1 sample and the R-3 model are not directly comparable on an item by item basis. However, it appears that the R-1 range is reasonable, and the R-3 model costs fall well within the same range. The end result of either manner appears to be reasonable and both include the major cost items that should be considered when estimating the potential costs of closing a specific Forest Supervisor's Office.

EXHIBIT 11

OPPORTUNITY FOR SAVING

The collection and analysis of data pertaining to potential savings was done by two methods at the Washington Office level and by one regional method as follows:

1. Washington Office Method No. 1

   The curve in Figure 4, page 40, illustrates that as the size of a Forest's adjusted budget increases, the percent of the total adjusted budget expended for general expense decreases. Therefore, if a Forest with a given size of adjusted budget was combined with Forests with smaller, equal, or larger adjusted budgets, the estimated general expense savings can be broadly estimated.

   Using the curve in Figure 4, as the basis for estimates, the range of potential annual savings are shown in Table 6. The estimated savings vary from $60,000 to $120,000 when considering Forests with theoretical adjusted budgets ranging from $750,000 to $5,000,000.

2. Washington Office Method No. 2

   As a check on Item 1 above, data from the Forest Service base workload measurement system were also used to estimate hypothetical savings possible from the elimination of a Forest Superivsor's Office.

   The workload measurement system makes allowances for economies of scale. For a given task, the number of hours allowed to accomplish one unit of work decreases as the total units of work increases.

   For example, the first ten units of a certain activity may require five hours each to accomplish or a total of 50 hours. If the Forest has enough business for 20 units, three hours might be allowed for each of the units above ten or a total of 80 hours to do twice as much work.

   Table 7 is based on estimates of minimum and maximum potential savings that theoretically could result from combining pairs of Forests operating at either the upper or lower ends of the volume of business sliding scale.

TABLE 6

ESTIMATED SAVINGS IF NATIONAL FORESTS OF VARIOUS SIZES ARE COMBINED

1. A Forest with adjusted budget of $750,000 (19.5% General Expense 146,250)

Combined with Forest				Combined Forest			
		Gen'l Exp.				Gen'l Exp.	
Adj.Budget	Gen'l Exp.%	$	Combined	Adj.Budget	Gen'l Exp%	$	Savings
750,000	19.5%	146,250	292,500	1,500,000	14%	210,000	82,500
1,000,000	17	170,000	316,250	1,750,000	13	227,500	88,750
1,500,000	14	210,000	356,250	2,250,000	12	270,000	86,250
2,000,000	12.5	250,000	396,250	2,750,000	11	302,500	93,750
2,500,000	11	275,000	421,250	3,250,000	10	325,000	86,250
3,000,000	10	300,000	446,250	3,750,000	10	375,000	71,250

A Forest with adjusted budget of $1,000,000 (17% General Expense 170,000)

Combined with Forest				Combined Forest			
		Gen'l Exp.				Gen'l Exp.	
Adj.Budget	Gen'l Exp.%	$	Combined	Adj.Budget	Gen'l Exp.%	$	Savings
1,000,000	17%	170,000	340,000	2,000,000	12.5%	250,000	90,000
1,500,000	14	210,000	380,000	2,500,000	11	275,000	105,000
2,000,000	12.5	250,000	420,000	3,000,000	10	300,000	120,000
2,500,000	11	275,000	445,000	3,500,000	10	350,000	95,000
3,000,000	10	300,000	470,000	4,000,000	10	400,000	70,000
3,500,000	10	350,000	520,000	4,500,000	10	450,000	70,000

3. A Forest with adjusted budget of $1,500,000 (14% General Expense 210,000

Combined with Forest				Combined Forest			
		Gen'l Exp.				Gen'l Exp.	
Adj.Budget	Gen'l Exp.%	$	Combined	Adj.Budget	Gen'l Exp.%	$	Savings
1,500,000	14%	210,000	420,000	3,000,000	10%	300,000	120,000
2,000,000	12.5	250,000	460,000	3,500,000	10	350,000	110,000
2,500,000	11	275,000	485,000	4,000,000	10	400,000	85,000
3,000,000	10	300,000	510,000	4,500,000	10	450,000	60,000
3,500,000	10	350,000	560,000	5,000,000	10	500,000	60,000

TABLE 7

THEORETICAL SAVINGS OPPORTUNITIES IF A NATIONAL FOREST HEADQUARTERS IS ELIMINATED

Item	Assumptions	Minimum Savings			Maximum Savings		
		Man Hours	Man Years	$	Man Hours	Man Years	$
SO Staff	Average hourly rate - $7.50	283	.16	2,122	4,165	2.31	31,238
Business Mgt. Group	Average hourly rate - $4.00	9,374	5.21	37,496	12,875	7.16	51,500
Project Mgt.	Average hourly rate - $7.00	--	--	--	563	.31	3,941
Space	Estimate 200 sq. ft. per person at $3.50 per sq. ft., $700 per M.Y.	--	--	3,759	--	--	6,846
Travel & other Expenses	10% of other general expense items	--	--	4,338	--	--	9,352
Total		9,657	5.37	47,715	17,603	9.78	102,877
Regional Office Savings		844	.47	6,928	844	.47	6,928
Total - RO and SO		10,501	5.84	54,643	18,447	10.25	109,805

Combination of two Forests theoretically operating at the lower end (maximum hourly allowance per unit of work) of the scale would result in maximum savings. Of course, this is the maximum possible, and it would be unusual for a Forest combination to maximize savings in every activity. To estimate the minimum amount of savings that could be expected, a little bit different approach was used. For certain jobs the mere existence of the activity required an investment of a certain number of hours per year. This base allowance is required whether the activity is large or small. Closing a Forest headquarters will, at the very least, save the base allowance for the office closed.

The range of theoretical savings varies from $54,600 to $109,800 and is summarized in Table 7.

The entire Regional Office savings item is based on the reduction of the inspection workload. The new R.O. base shows number of Forests as having little impact on the R.O. base workload. Note that space is included in Table 7.

3. Regional Model for Estimating Potential Savings

To estimate potential savings, one regional team constructed a model for combining sample Forests A and C into one Forest AC. Major savings appear to lie in three areas--(1) Base Supervisor and staff, Resource Project staff, and Business Management staff costs; (2) Engineering Project staff costs; and (3) Elimination of space cost for one Forest Supervisor's Office. To illustrate:

a. Base Supervisor and Staff, Resource Project Staff, and Business Management Costs.

(1) FY 1969 Operating Costs

Forest	Supervisor & Staff Primary & Specialized	Business Management	Total
C	$113,259	$101,094	$214,353
A	175,125	137,457	312,582
Total	$288,384	$238,551	$526,935

(2) Estimated FY Operating Costs - Combined Forest

Supervisor & P&S Staff		Business Management	
1 GS14 @ $19,000 =	$19,000	1 GS12 @ $14,000 =	$14,000
1 GS13 @ $16,000 =	$16,000	3 GS11 @ $12,000 =	$36,000
6 GS12 @ $14,000 =	$84,000	4 GS9 @ $ 9,000 =	$36,000
4 GS11 @ $12,000 =	$48,000	3 GS7 @ $ 8,000 =	$24,000
7 GS9 @ $ 9,000 =	$63,000	5 GS5 @ $ 7,000 =	$35,000
		6 GS4 @ $ 6,000 =	$36,000
		4 GS3 @ $ 4,000 =	$16,000
19	$230,000	26	$197,000
			+ 230,000
		Total Cost------	$427,000

(3) Savings - Gross

Supervisor, P&S, and BM Staff on Forests A+C = $526,935
Supervisor, P&S, and BM Staff on Forest AC = -427,000

Savings------ $ 99,935

b. Engineering Project Salary Costs

(1) FY 1969 Operating Costs

Forest	Number	Costs
A	19	$153,158
C	7	52,699
Total	26	$205,857

(2) Estimated FY Operating Costs - Combined Forest - AC

Number	Cost
3 GS-11	$36,000
4 GS-9	36,000
2 GS-7	16,000
1 GS-4	4,000
12 WB	95,000
22	$187,000

(3) Savings - Gross

Engineering Project Salary Costs, Forest A+C =	$205,857
Engineering Project Salary Costs, Forest AC =	-187,000
	$ 18,857

c. Space Costs

Office Space Costs - Forest C = $21,000

d. Total Savings (Per Year)

Supervisor + Staff + BM =	$99,935
Engineering Project Salaries =	18,857
Space Cost =	21,000
Total Savings	$139,792

Estimated Savings for ten (10) years = $1,397,920

e. Net Savings for Ten Years

Estimated Total Savings =	$1,397,920
Cost of Consolidation =	- 76,535
Net Potential Savings for 10 Years =	$1,321,385

4. Estimated Range of Annual Savings

The methods used to estimate potential annual savings in items 1, 2, and 3 above range from $54,000 to $139,000. While the methods are not directly comparable, they indicate substantial savings opportunities are available in the elimination of Forest Supervisor headquarters.

GPO 919-641


PACIFIC NORTHWEST REGION
PACIFIC NORTHWEST
PORTLAND
OLYMPIC
MT. BAKER
OKANOGAN
COLVILLE
KANIKSU
KOOTENAI
WENATCHEE
SNOQUALMIE
GIFFORD PINCHOT
WASH.
MT HOOD
SIUSLAW
UMATILLA
WALLOWA
WHIT-MAN
CROOKED RIVER
WILLAMETTE
UMPQUA
SISKIYOU
ROGUE RIVER
OCHOCO
DESCHUTES
MALHEUR
FREMONT
WINEMA
CF-20
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SIX RIVERS
KLAMATH
MODOC
SHASTA TRINITY
LASSEN
MENDOCINO
PLUMAS
TAHOE
ELDORADO
PACIFIC SOUTHWEST
STANISLAUS
CALAVERAS BIG TREE
SAN FRANCISCO
SIERRA
SEQUOIA
INYO
LOS PADRES
CALIFORNIA REGION
LOS PADRES
CALIF.
ANGELES
SAN BERNARDINO
CLEVELAND
COEUR D'ALENE
FLATHEAD
ST. JOE
LOLO
CLEARWATER
MISSOULA
LEWIS AND CLARK
HELENA
LEWIS AND CLARK
NEZPERCE
BITTER ROOT
DEER LODGE
GALLATIN
PAYETTE
SALMON
BEAVERHEAD
CUSTER
CHALLIS
BOISE
SAWTOOTH
TARGHEE
TETON
IDAHO
NORTHERN REGION
MONT.
N. DAK.
LITTLE MISSOURI
SHEYENNE
CEDAR RIVER
GRAND RIVER
CUSTER
SHOSHONE
BIGHORN
BLACK HILLS
S. DAK.
THUNDER BASIN
FORT PIERRE
BUFFALO GAP
OGLALA
WYO.
CARIBOU
SAWTOOTH
HUMBOLDT
CURLEW
BRIDGER
CACHE
OGDEN
INTERMOUNTAIN
WASATCH
ASHLEY
MEDICINE BOW
NEBRASKA
NEBR.
NEV.
HUMBOLDT
TOIYABE
INTERMOUNTAIN REGION
WASATCH
UINTA
UINTA
FISHLAKE
MANTI-LA SAL
UTAH
ROUTT
PAWNEE
ROCKY MOUNTAIN
ROOSEVELT
WHITE RIVER
ARAPAHO
DENVER
ROCKY MOUNTAIN REGION
GRAND MESA
PIKE
COLO.
UNCOM-PAHGRE
GUNNISON
SAN ISABEL
MANTI-LA SAL
DIXIE
KANS.
SAN JUAN
RIO GRANDE
COMANCHE
CIMARRON
TOIYABE
KAIBAB
SOUTHWESTERN REGION
CARSON
CARSON
KIOWA
RITA BLANCA
KAIBAB
CIBOLA
SANTA FE
BLACK KETTLE
COCONINO
PRESCOTT
SITGREAVES
ALBUQUERQUE
LAKE MC CLELLAN
OKLA
TONTO
N. MEX.
APACHE
CIBOLA
ARIZ.
GILA
LINCOLN
CORONADO
CORONADO
CROSS TIMBERS
TEXAS
ALASKA REGION
ALASKA
INSTITUTE OF NORTHERN FORESTRY
JUNEAU
CHUGACH
TONGASS
MILES
200
400
INSTITUTE OF TROPICAL FORESTRY
RIO PIEDRAS
CARIBBEAN
PUERTO RICO